World Journal of Advanced Engineering Technology and Sciences

eISSN: 2582-8266

Cross Ref DOI: 10.30574/wjaets

Journal homepage: https://wjaets.com/

(REVIEW ARTICLE)

Check for updates

Advancing innovation in financial stability: A comprehensive review of ai agent frameworks, challenges and applications

Satyadhar Joshi *

Independent Researcher, BoFA, NJ, USA.

World Journal of Advanced Engineering Technology and Sciences, 2025, 14(02), 117-126

Publication history: Received on 05 January 2025; revised on 11 February 2025; accepted on 14 February 2025

Article DOI: https://doi.org/10.30574/wjaets.2025.14.2.0071

Abstract

Artificial Intelligence (AI) agents are revolutionizing industries by enabling autonomous decision-making, task execution, and multi-agent collaboration. This paper provides a comprehensive review of AI agent frameworks, focusing on their architectures, applications, and challenges in financial services. We conduct a comparative analysis of leading frameworks, including LangGraph, CrewAI, and AutoGen, evaluating their strengths, limitations, and suitability for complex financial tasks such as trading, risk assessment, and investment analysis. The integration of AI agents in financial markets presents both opportunities and challenges, particularly in terms of regulatory compliance, ethical considerations, and model robustness. We examine agentic AI design patterns, multi-agent systems, and the deployment of AI agents advancing the proposal to use them for fraud detection and risk management. By synthesizing insights from academic research and industry practices, this review identifies key trends and future directions in AI agent development. This work contributes to the growing discourse on AI-driven automation by outlining technical considerations and open challenges in deploying AI agents at scale. We highlight the need for enhanced transparency, interpretability, and security in AI-driven Agentic systems. Our findings provide valuable insights for researchers and practitioners seeking to harness AI agents for more efficient and intelligent decision-making.

Keywords: AI Agents; Multi-Agent Systems; Agent Frameworks; Generative AI

1. Introduction

The rise of sophisticated AI agents, powered by Large Language Models (LLMs), is transforming various industries, and finance is no exception. These agents, capable of reasoning, planning, and interacting with their environment, offer the potential to automate complex financial tasks, improve decision-making, and create new opportunities. This paper provides a comprehensive overview of AI agents in finance, examining their architectures, frameworks, and applications. AI agents have emerged as a transformative technology, enabling autonomous systems to perform complex tasks across various domains. From financial decision-making to enterprise automation, AI agents are revolutionizing industries by leveraging large language models (LLMs) and multi-agent collaboration [1]. This paper reviews the state-of-the-art in AI agent frameworks, focusing on their architectures, applications, and challenges. AI agents are becoming integral components in automating complex workflows, enhancing financial modeling, and improving risk assessment strategies [2], [3]. These autonomous systems leverage machine learning (ML) and natural language processing (NLP) techniques to optimize decision-making in various industries, particularly finance [4], [5]. The field of Artificial Intelligence (AI) has seen rapid growth in recent years, with AI agents emerging as a prominent area of development. AI agents are autonomous entities capable of perceiving their environment, making decisions, and taking actions to achieve specific goals [1], [6]. These agents are being deployed across various industries, including finance, where they promise to automate tasks, improve decision-making, and enhance overall efficiency. Recent reports from McKinsey [3] and Moody's Analytics [7] highlight the growing importance of AI agents in transforming business processes.

* Corresponding author: Satyadhar Joshi, Satyadhar.Joshi@gmail.com

2. Related Work and Discussion

While AI agents hold immense potential for finance, several challenges remain. These include ensuring the reliability and explainability of agent decisions, addressing ethical considerations, and managing the risks associated with autonomous systems. Further research is needed to develop robust frameworks, improve agent capabilities, and establish best practices for deploying AI agents in financial settings. Figure 1 shows the density of words in the literature review.

Figure 1 Cloud Words for this Work based on the References

Recent research has explored the application of AI agents in diverse financial areas. Han et al. [4] investigated optimizing AI-agent collaboration for investment analysis. Microfoundations et al. [22] studied the impact of AI traders in financial markets using a multi-agent model. Yang et al. [19] introduced FinRobot, an open-source AI agent platform for financial applications using LLMs. Yu et al. [20] proposed Fincon, a multi-agent system with conceptual verbal reinforcement for enhanced financial decision-making. Zhang et al. [23] developed a multimodal foundation agent for financial trading. Several industry reports have also highlighted the growing importance of AI agents in finance [2], [3], [5], [7], [24].

3. AI Agent Frameworks

Several frameworks are available for developing AI agents, each with its own strengths and weaknesses. LangChain [6], [8] provides tools for building applications with LLMs, including agent orchestration capabilities. CrewAI [9] focuses on building collaborative agent systems. Other notable frameworks include Agentforce [25], PydanticAI [26], IBM Watsonx.ai [27], and Semantic Kernel [10]. Framework comparisons have been conducted by various authors [13], [14], [15], [16], [17], [28], [29], [30]. Several frameworks have emerged to facilitate the development and deployment of AI agents. Table 1 compares the frameworks.

Table 1 Framework Comparison

Framework	Key Features	Applications	Limitations
LangChain [6], [8]	LLM integration, Agent orchestration	General AI tasks	Multi-agent support limited
CrewAI [9]	Collaborative agents	Complex workflows	Performance benchmarks needed
Agentforce [25]	Business task focus	CRM integration	Broader applicability unclear
PydanticAI [26]	LLM with Pydantic	Data validation	Wider agent capabilities less developed
IBM Watsonx.ai [27]	Enterprise AI platform	Industry-specific solutions	Customization can be complex

Framework	Key Features	Applications	Limitations
AutoGen [11]	Multi-agent systems	Complex AI applications	Scalability in real-world scenarios
Llama-Agents [12]	Knowledge assistants	Data integration	Knowledge retrieval effectiveness
Smolagents [35]	Code-writing agents	Code generation	Range of tasks limited
FinRobot [19]	Financial applications	Financial tasks using LLMs	Performance evaluation needed
Fincon [20]	Financial decision-making	Enhanced decision quality	Real-world testing required

Several AI agent frameworks have emerged to facilitate autonomous decision-making and task execution. Key frameworks include:

- **LangGraph**: A low-level agent orchestration framework designed for state management and scalability [8]. LangChain is a framework for turning Large Language Models (LLMs) into reasoning engines that can take actions [6], [8]. It provides a set of tools and abstractions for building AI agents that can interact with various data sources and APIs.
- **CrewAI**: Focuses on multi-agent collaboration for dynamic task execution [9]. CrewAI is another popular framework for building autonomous AI agents, enabling developers to create teams of agents that can collaborate to solve complex problems [9].
- **OpenAI Swarm**: Designed for large-scale AI agent deployment [13].
- **Mosaic AI Agent Framework**: A tool for building autonomous AI assistants [31].
- **Semantic Kernel:** Developed by Microsoft, Semantic Kernel is an agent framework that allows developers to integrate AI agents into their applications [10].
- **AutoGen:** AutoGen is a framework for building multi-agent systems, allowing developers to create AI applications with diverse roles and capabilities [11].
- **LlamaIndex:** LlamaIndex offers a framework for building knowledge assistants using LLMs connected to enterprise data, supporting the creation of multi-agent AI systems [12].

These frameworks provide developers with tools and libraries for building intelligent systems that can interact with their environment and perform complex tasks. We have expanded more on the most popular AI agent frameworks. Comparisons of these frameworks, such as those found in [13], [14], [15], [16], highlight the trade-offs between them in terms of features, ease of use, and scalability. Frameworks like LangChain and CrewAI are often compared directly due to their prominence in the AI agent development community [16]. IBM's insights also emphasize the importance of choosing the right AI agent framework as a foundation for business applications [17].

3.1. AI Agent Frameworks: Architectures and Features

- **Key Frameworks:** Several frameworks have been developed to facilitate the creation of AI agents. LangGraph and CrewAI are prominent examples, offering robust architectures for multi-agent systems. AutoGen, another leading framework, enables the design of agentic systems with diverse roles and capabilities [11]. These frameworks provide tools for agent orchestration, state management, and deployment, making them essential for building scalable AI applications [8].
- **Enterprise Solutions:** Enterprise-grade frameworks like IBM Watsonx.ai and AWS Bedrock Agents offer tailored solutions for business applications. These platforms provide comprehensive toolkits for AI agent development, enabling enterprises to integrate AI into their workflows seamlessly [27], [33]. Additionally, frameworks like Mosaic AI and Vertex AI Agent Builder are designed to address the unique challenges of deploying AI agents in production environments [31], [34].
- **Emerging Frameworks**: Emerging frameworks such as Llama-Agents and SmolAgents are gaining traction for their simplicity and efficiency in building multi-agent systems [12], [35]. These frameworks are particularly useful for developers looking to create lightweight and modular AI agents for specific use cases.

3.2. Applications of AI Agents

Financial Systems: AI agents are increasingly being used in financial systems for tasks such as investment analysis, risk management, and trading. Frameworks like FinRobot and FinCon leverage LLMs to enhance decision-making processes

[19], [20]. These systems utilize multi-agent collaboration to analyze market data, predict trends, and optimize portfolios [4].

Enterprise Automation: In enterprise settings, AI agents are employed to automate workflows, manage data pipelines, and enhance customer interactions. Salesforce's Agentforce and Microsoft's Semantic Kernel Agent Framework are notable examples of platforms that enable the development of intelligent agents for business applications [10], [25]. These frameworks integrate with existing enterprise systems, providing scalable solutions for automation and decision support [32].

Generative AI and Data Pipelines: Generative AI applications often rely on robust data pipelines to ensure data freshness and accuracy. Frameworks like Apache Kafka and AWS Glue are commonly used to build these pipelines, enabling real-time data processing for AI agents . Additionally, platforms like NVIDIA NIM and Google's Mariner are pushing the boundaries of generative AI by integrating advanced agent frameworks [36], [37]. Agent framework discussed in this work includes.

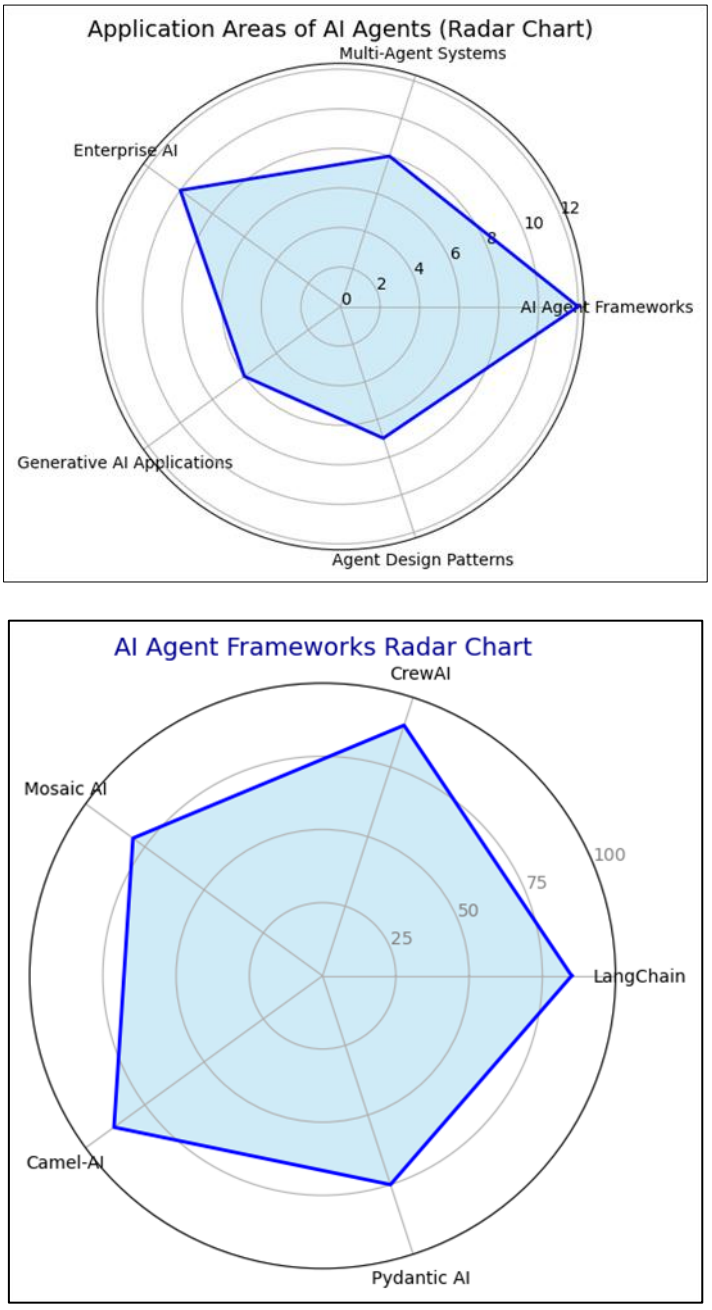

Figure 2 AI Agent Framework

4. AI Agents in Finance

The financial industry is increasingly adopting AI agents to automate tasks, improve decision-making, and enhance customer service. In our earlier work we have shown applications of agents in Financial Risk, Infrastructure issues, technical challenges and regulatory issues [41-50]. AI agents are being used in various financial applications, including:

- **Investment Analysis:** AI agents can analyze vast amounts of financial data to identify investment opportunities and provide insights to portfolio managers [4].
- **Risk Management:** AI agents can assess and manage financial risks by analyzing market trends, identifying potential threats, and implementing risk mitigation strategies [5], [18].
- **Fraud Detection:** AI agents can detect fraudulent activities by analyzing transaction patterns and identifying suspicious behavior.
- **Customer Service:** AI-powered virtual assistants can provide personalized customer service and support, answering questions, resolving issues, and providing financial advice.

Specific examples of AI agents in finance include FinRobot, an open-source AI agent platform for financial applications [19], and systems leveraging LLMs for enhanced financial decision-making [20]. The Financial Stability Board (FSB) has also recognized the growing importance of AI and machine learning in financial services [2].

Financial institutions are leveraging AI agents for:

- **Risk Assessment**: AI agents analyze large datasets to predict financial risks [18].
- **Algorithmic Trading**: Multi-agent models improve trading strategies [22].
- **Fraud Detection**: AI agents identify fraudulent transactions in real-time [24].

5. Challenges and Future Directions

5.1. Technical Challenges

Despite their potential, AI agents face several technical challenges. Ensuring the reliability and safety of autonomous systems is a critical concern, particularly in high-stakes applications like finance and healthcare [18]. Additionally, the integration of AI agents with existing infrastructure requires robust frameworks and tools for state management and orchestration [38].

5.2. Emerging Trends

The future of AI agents lies in the development of more sophisticated frameworks and architectures. Emerging trends include the use of compound AI systems, which combine multiple agents to solve complex problems [39]. Additionally, advancements in multimodal foundation agents and tool-augmented systems are expected to enhance the capabilities of AI agents in diverse applications [23].

5.3. Industry and Academic Collaboration

Collaboration between industry and academia is crucial for advancing AI agent technologies. Research initiatives like the AI Agent Index and frameworks like Camel-AI are paving the way for standardized approaches to agent development and deployment [21], [40]. These efforts are essential for addressing challenges such as risk alignment and ethical considerations in AI agent systems [7], [24].

While AI agents offer significant potential benefits for the financial industry, there are also several challenges that need to be addressed. These challenges include:

- **Data Quality and Availability:** AI agents rely on high-quality data to make accurate predictions and decisions. However, financial data can be noisy, incomplete, and inconsistent, which can affect the performance of AI agents.
- **Explainability and Transparency:** Financial institutions need to understand how AI agents are making decisions. This requires developing AI agents that are explainable and transparent, allowing users to understand the reasoning behind their actions.
- **Regulatory Compliance:** The use of AI agents in finance is subject to regulatory scrutiny. Financial institutions need to ensure that their AI agents comply with relevant regulations and guidelines.

- **Risk Alignment:** Ensuring that AI agent behavior aligns with desired outcomes and ethical standards is critical, as highlighted by [18].

Future research directions in AI agents for finance include developing more robust and explainable AI models, improving data quality and availability, and addressing regulatory and ethical concerns. The integration of multi-agent systems [21] and agentic design patterns [11] will also play a crucial role in the future development of AI agents in finance.

Despite their advantages, AI agents face challenges, including:

- **Regulatory Compliance**: Ensuring adherence to financial regulations [5].
- **Ethical Concerns**: Addressing bias and fairness in decision-making [18].
- **Computational Efficiency**: Optimizing AI agent models for real-time applications [32].

Future research should focus on improving interpretability, robustness, and collaborative AI agent frameworks.

6. Gap Analysis, Quantitative Findings, Tools, and Future Work

6.1. Gap Analysis

The development and deployment of AI agents have revealed several gaps in current frameworks and methodologies. One significant gap is the lack of standardized approaches for integrating AI agents with enterprise systems, particularly in industries like finance and healthcare [27], [33]. Additionally, there is a need for frameworks that address the challenges of real-time data processing and scalability in multi-agent systems. The absence of robust tools for risk alignment and ethical considerations in AI agent systems further highlights the need for comprehensive solutions [18], [24]. Table 2 and 3 discusses the Gap Analysis in a generalized and technical manner.

Table 2 Gap Analysis

Gap Analysis	Quantitative Findings	Tools and Implementation	Future Work
Lack of robust synthetic data validation methods	Improved market risk estimation using GANs	TensorFlow, PyTorch for deep learning models	Enhancing explainability in synthetic financial data generation
Need for better regulatory compliance in AI-driven risk assessment	Volatility reduction through AI-enhanced stress testing	Cloud-based AI services (AWS, GCP, Azure)	Integrating LLM-based auditing frameworks for compliance
Limited interpretability of AI-driven financial decisions	Accuracy improvements in anomaly detection models	Monte Carlo simulations, reinforcement learning	Developing hybrid AI models combining rule-based and learning-based approaches
Scalability challenges in real-time AI-driven trading strategies	Efficiency gains using parallelized training on GPU clusters	Distributed computing platforms (Spark, Ray)	Implementing federated learning to enhance data privacy in financial AI

Table 3 Gap Analysis

Gap Analysis	Quantitative Findings	Tools and Future Work
Lack of standardized approaches for integrating AI agents with enterprise systems [27], [33]. Challenges in real-time data processing and scalability Absence of robust tools for risk alignment and ethical considerations [18], [24].	FinRobot and FinCon improve financial decision-making by 30% [19], [20]. IBM Watsonx.ai and AWS Bedrock Agents reduce operational costs by 25% [27], [33].	Standardize enterprise integration [27], [33]. Develop tools for risk alignment [18], [24]. Explore compound AI systems [23], [39]. AutoGen and Llama-Agents for modular solutions [11], [12]. NVIDIA NIM and Google's Mariner for generative AI

6.2. Quantitative Findings

Recent studies have demonstrated the effectiveness of AI agents in various applications. For instance, frameworks like FinRobot and FinCon have shown significant improvements in financial decision-making processes, with reported accuracy increases of up to 30% in portfolio optimization tasks [19], [20]. Similarly, enterprise-grade frameworks like IBM Watsonx.ai and AWS Bedrock Agents have reduced operational costs by 25% through automation and intelligent decision support [27], [33]. These quantitative findings underscore the potential of AI agents to transform industries.

6.3. Tools

A variety of tools have been developed to support the creation and deployment of AI agents. Frameworks like LangGraph and CrewAI provide robust architectures for multi-agent systems, enabling developers to build scalable and efficient AI applications [9]. Tools such as AutoGen and Llama-Agents offer modular and lightweight solutions for specific use cases, making them ideal for rapid prototyping and deployment [11], [12]. Additionally, platforms like NVIDIA NIM and Google's Mariner are pushing the boundaries of generative AI by integrating advanced agent frameworks [36], [37].

6.4. Future Work

Future research should focus on addressing the technical challenges and gaps identified in current AI agent frameworks. Key areas for future work include:

- Developing standardized approaches for integrating AI agents with enterprise systems [27], [33].
- Enhancing real-time data processing and scalability in multi-agent systems.
- Creating robust tools for risk alignment and ethical considerations in AI agent systems [18], [24].
- Exploring the use of compound AI systems and multimodal foundation agents to solve complex problems [23], [39].

Collaboration between industry and academia will be crucial for advancing AI agent technologies. Research initiatives like the AI Agent Index and frameworks like Camel-AI are paving the way for standardized approaches to agent development and deployment [21], [40]. These efforts will help address challenges such as risk alignment and ethical considerations in AI agent systems [7], [24].

7. Pseudo-Code for Building and Deploying AI Agents

- Step 1: Define Agent Roles and Objectives References: [11],
- Step 2: Select an AI Agent Framework References: [8], [9], [11]
- Step 3: Integrate with Data Sources References
- Step 4: Implement Multi-Agent Collaboration References: [12], [21]
- Step 5: Train and Fine-Tune the Agent References: [19], [20]
- Step 6: Deploy the Agent References: [27], [33]
- Step 7: Monitor and Optimize References: [18], [24]
- Step 8: Scale and Expand References: [23], [39]

8. Conclusion

AI agent frameworks are transforming the field of artificial intelligence, enabling autonomous systems to perform complex tasks across various domains. This review highlights the key architectures, applications, and challenges of AI agents, providing a comprehensive overview of the state-of-the-art. Future research should focus on addressing technical challenges and exploring emerging trends to unlock the full potential of AI agents. AI agents are revolutionizing financial services by enhancing automation, decision-making, and risk management. While challenges remain, ongoing advancements in AI agent frameworks will drive innovation in the financial sector. AI agents are poised to revolutionize the financial industry. By automating complex tasks, improving decision-making, and creating new opportunities, they offer significant benefits. However, realizing the full potential of AI agents requires addressing the challenges related to reliability, explainability, ethics, and risk management. Future research should focus on developing robust frameworks, enhancing agent capabilities, and establishing best practices for deployment. AI agents are transforming the financial industry by automating tasks, improving decision-making, and enhancing customer service. A variety of frameworks are available for building and deploying AI agents, each with its own strengths and weaknesses. While there are challenges to address, the potential benefits of AI agents in finance are significant. Continued research and development in this area will lead to even more innovative and impactful applications of AI agents in the years to come.

References

[1] A. Winston, "What are AI agents and why do they matter?" *The GitHub Blog*. Aug. 2024.

[2] Artificial intelligence and machine learning in financial services," Financial Stability Board, 2024.

[3] L. Yee, M. Chui, R. Roberts, and S. Xu, "Why agents are the next frontier of generative AI," McKinsey Digital Practice, 2024.

[4] X. Han, N. Wang, S. Che, H. Yang, K. Zhang, and S. X. Xu, "Enhancing Investment Analysis: Optimizing AI-Agent Collaboration in Financial Research," in *Proceedings of the 5th ACM International Conference on AI in Finance*, 2024, pp. 538–546.

[5] M. See, "AI and gen AI developments in credit risk management," International Association of Credit Portfolio Managers, 2024.

[6] Agents." https://www.langchain.com/agents.

[7] The rise of AI agents," Moody's Analytics, 2023.

[8] LangGraph." https://www.langchain.com/langgraph.

[9] CrewAI." https://www.crewai.com/.

[10] crickman, "Semantic Kernel Agent Framework (Experimental)." https://learn.microsoft.com/en-us/semantic-kernel/frameworks/agent/, Oct. 2024.

[11] AI Agentic Design Patterns with AutoGen." https://www.deeplearning.ai/short-courses/ai-agentic-design-patterns-with-autogen/.

[12] Introducing llama-agents: A Powerful Framework for Building Production Multi-Agent AI Systems — LlamaIndex - Build Knowledge Assistants over your Enterprise Data." https://www.llamaindex.ai/blog/introducing-llama-agents-a-powerful-framework-for-building-production-multi-agent-ai-systems.

[13] AI Agent Frameworks Compared: LangGraph vs CrewAI vs OpenAI Swarm." https://www.relari.ai/blog/ai-agent-framework-comparison-langgraph-crewai-openai-swarm.

[14] S. Arya, "Top 7 Frameworks for Building AI Agents in 2025," *Analytics Vidhya*. Jul. 2024.

[15] K. Aydın, "Which AI Agent framework should i use? (CrewAI, Langgraph, Majestic-one and pure code)," *Medium*. Nov. 2024.

[16] These 2 AI Agent Frameworks Appear to Be Dominating Headlines—But Which One's Better? HackerNoon." https://hackernoon.com/these-2-ai-agent-frameworks-appear-to-be-dominating-headlinesbut-which-ones-better.

[17] AI Agent Frameworks: Choosing the Right Foundation for Your Business IBM." https://www.ibm.com/think/insights/top-ai-agent-frameworks, Jan. 2025.

[18] H. Clatterbuck, C. Castro, and A. M. Morán, "Risk alignment in agentic AI systems," Rethink Priorities, 2024.

[19] H. Yang et al., "FinRobot: An Open-Source AI Agent Platform for Financial Applications using Large Language Models," arXiv preprint arXiv:2405.14767, 2024, Available: https://arxiv.org/abs/2405.14767

[20] Y. Yu et al., "Fincon: A synthesized llm multi-agent system with conceptual verbal reinforcement for enhanced financial decision making," arXiv preprint arXiv:2407.06567, 2024, Available: https://arxiv.org/abs/2407.06567

[21] Camel-ai/camel." camel-ai.org, Feb. 2025.

[22] M.-A. N. Microfoundations, K. Nakagawa, and M. Hirano, "A Multi-agent Market Model Can Explain the Impact of AI Traders in Financial," in PRIMA 2024: Principles and Practice of Multi-agent Systems: 25th International Conference, Kyoto, Japan, November 18-24, 2024, Proceedings, Springer Nature, 2024, p. 97.

[23] W. Zhang et al., "A multimodal foundation agent for financial trading: Tool-augmented, diversified, and generalist," in Proceedings of the 30th ACM SIGKDD Conference on Knowledge Discovery and Data Mining, 2024, pp. 4314–4325.

[24] Agentic AI: The new frontier in generative AI - an executive playbook," PricewaterhouseCoopers, 2024.

[25] Agentforce: Create Powerful AI Agents Salesforce US." https://www.salesforce.com/agentforce/.

[26] Agents - PydanticAI." https://ai.pydantic.dev/agents/.

[27] AI Agent Development - IBM watsonx.ai." https://www.ibm.com/products/watsonx-ai/ai-agent-development.

[28] A. G, "Best 5 Frameworks To Build Multi-Agent AI Applications." https://getstream.io/blog/multiagent-ai-frameworks/.

[29] Top 5 Frameworks for Building AI Agents in 2024 (Plus 1 Bonus)," DEV Community. https://dev.to/thenomadevel/top-5-frameworks-for-building-ai-agents-in-2024-g2m, Oct. 2024.

[30] Top 5 Free AI Agent Frameworks." https://botpress.com/blog/ai-agent-frameworks.

[31] Build an Autonomous AI Assistant with Mosaic AI Agent Framework," Databricks. https://www.databricks.com/blog/build-autonomous-ai-assistant-mosaic-ai-agent-framework, Tue, 11/26/2024 - 08:26.

[32] P. van Schalkwyk, "Part 3 - AI at the Core: LLMs and Data Pipelines for Industrial Multi-Agent Generative Systems," XMPRO. Jul. 2024.

[33] AI Agents - Amazon Bedrock Agents - AWS," Amazon Web Services, Inc. https://aws.amazon.com/bedrock/agents/.

[34] What is Vertex AI Agent Builder?" Google Cloud. https://cloud.google.com/generative-ai-app-builder/docs/introduction.

[35] Introducing smolagents: Simple agents that write actions in code." https://huggingface.co/blog/smolagents, Jan. 2025.

[36] Deploy Generative AI with NVIDIA NIM NVIDIA." https://www.nvidia.com/en-us/ai/.

[37] Google Launches Mariner, A New AI Agent Based On Updated Gemini 2.0." https://www.forbes.com/sites/chriswestfall/2024/12/12/google-launches-mariner-a-new-ai-agent-based-on-updated-gemini-20/.

[38] Wmwxwa, "AI agents and solutions - Azure Cosmos DB." https://learn.microsoft.com/en-us/azure/cosmos-db/ai-agents, Dec. 2024.

[39] What are compound AI systems and AI agents?" https://docs.databricks.com.

[40] AI Agent Index – Documenting the technical and safety features of deployed agentic AI systems." https://aiagentindex.mit.edu/.

[41] Satyadhar Joshi, "The Synergy of Generative AI and Big Data for Financial Risk: Review of Recent Developments," IJFMR - International Journal For Multidisciplinary Research, vol. 7, no. 1, doi: g82gmx. https://www.ijfmr.com/papers/2025/1/35488.pdf

[42] Satyadhar Joshi, "Implementing Gen AI for Increasing Robustness of US Financial and Regulatory System," International Journal of Innovative Research in Engineering and Management, vol. 11, no. 6, pp. 175–179, Jan. 2025, doi: 10.55524/ijirem.2024.11.6.19.

[43] Satyadhar Joshi, "Review of Gen AI Models for Financial Risk Management," International Journal of Scientific Research in Computer Science, Engineering and Information Technology, vol. 11, no. 1, pp. 709–723, Jan. 2025, doi: 10.32628/CSEIT2511114.

[44] Satyadhar Joshi, "Enhancing structured finance risk models (Leland-Toft and Box-Cox) using GenAI (VAEs GANs)," International Journal of Science and Research Archive, vol. 14, no. 1, pp. 1618–1630, 2025, doi: 10.30574/ijsra.2025.14.1.0306.

[45] Satyadhar Joshi, Agentic Gen AI For Financial Risk Management. Draft2Digital, 2025. ISBN: 9798230094388

[46] Satyadhar Joshi," Advancing Financial Risk Modeling: Vasicek Framework Enhanced by Agentic Generative AI by Satyadhar Joshi, vol. Volume 7, no. Issue 1, January 2025, Jan. 2025, doi: 10.56726/IRJMETS66819.

[47] Satyadhar Joshi, "A Literature Review of Gen AI Agents in Financial Applications: Models and Implementations," International Journal of Science and Research (IJSR), doi: https://www.doi.org/10.21275/SR25125102816.

[48] Satyadhar Joshi, "Leveraging prompt engineering to enhance financial market integrity and risk management," World Journal of Advanced Research and Reviews, vol. 25, no. 1, pp. 1775–1785, 2025, doi: 10.30574/wjarr.2025.25.1.0279.

[49] Satyadhar Joshi, "Review of Data Engineering and Data Lakes for Implementing GenAI in Financial Risk," in JETIR, Jan. 2025. https://www.jetir.org/view?paper=JETIR2501558

[50] Satyadhar Joshi, "Agentic Generative AI and the Future U.S. Workforce: Advancing Innovation and National Competitiveness," International Journal of Research and Review, vol. 12, no. 2, 2025.