

# Deepseek in Enterprise Intelligent Financial Alerting

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## Abstract

**The article analyzes the current research status of DeepSeek and the applicability of intelligent financial early warning, adopts the technology acceptance model to match the demand for intelligent financial early warning with the technical route of DeepSeek application, discusses the multimodal data processing and dynamic early warning model of DeepSeek, and puts forward the "1+5+N" It also proposes the "1+5+N" application system framework, which covers the core aspects of data integration, risk identification, trend prediction, etc., and realizes multimodal data fusion and real-time monitoring through layered architecture. At the same time, it reveals the main challenges currently faced: the contradiction between the demand for high-performance hardware in the core model and the lack of arithmetic power in SMEs, the technical bottleneck of multimodal data cleaning and fusion, and the limitations of the adaptability of the dynamic early warning model in unexpected events. To address these issues, it is recommended that the technology should be promoted by strengthening the sharing of computing power, formulating unified industry standards, and cross-domain data fusion.**

## Keywords

**Artificial Intelligence; Deepseek; Machine Learning Approach; Multimodal Data Processing; Dynamic Financial Alerts.**

## 1. Introductory

Artificial Intelligence (AI), as one of the most transformative technologies of the 21st century, has become a core area of global technological competition and a core driving force for various industries. During the second collective study of the Political Bureau of the twentieth Central Committee held in June 2023, General Secretary Xi Jinping pointed out that it is necessary to promote the deep integration of digitization and the real economy, and to push forward the wide application of AI, big data, cloud computing, and other technologies in various fields to help industrial upgrading and high-quality economic development. At the beginning of 2025, the launch of DeepSeek, developed by Hangzhou DeepSeek Artificial Intelligence Basic Technology Research Company Limited (hereinafter referred to as "DeepSeek"), set off a wave of change.

Financial Risk Early Warning (Financial Risk Early Warning) refers to the management mechanism of identifying, evaluating and warning potential financial crises in the enterprise's business activities by building a systematic monitoring index system and using data analysis technology, aiming at realizing the capture of risk precursors, judging of conduction paths, and pre-setting of prevention and control strategies. At present, under the impetus of the "14th Five-Year Plan" digital transformation strategy, China's enterprise financial risk management has entered the intelligent exploration stage. Relying on big data analysis and machine learning technology, some leading enterprises have constructed intelligent early warning models such as cash flow prediction and solvency assessment, initially realizing digital monitoring of abnormal financial fluctuations. However, practice shows that the fragmented distribution of enterprise financial data has led to significant limitations in risk identification: on the one hand,

the data silos of procurement, production, sales and other business systems make it difficult to trace financial risks, and only rely on financial statement data with a strong lag for static assessment; on the other hand, the existing early warning model focuses on structured data mining, and has weak capture capability of unstructured risk signals, such as industry public opinion and supply chain fluctuations, which makes it difficult to capture the risk signals. On the other hand, existing early warning models are mostly focused on structured data mining, and their ability to capture unstructured risk signals such as industry public opinion and supply chain fluctuations is weak, which makes it difficult to cope with the dynamic risk evolution in the complex market environment. This dual dilemma of "fragmented data and rigid models" has seriously restricted the timeliness and foresight of corporate financial risk early warning. In the "15th Five-Year Plan", financial early warning should focus on data integration and cross-departmental collaboration, and build a risk prevention and control paradigm with "AI+blockchain+multimodal data". This study focuses on the application of DeepSeek in intelligent financial early warning, and analyzes the suitability of its technical characteristics and financial early warning needs. Through the Technology Acceptance Model (TAM), we explore the acceptance of the technology by financial staff and business managers, and assess the feasibility and potential of its application. Further combining DeepSeek's technology system with the actual needs of enterprise financial early warning, we design the technology application route and propose the application system framework around multi-source data fusion, dynamic early warning model construction and intelligent decision support, with a view to providing useful references for the further research and practice of intelligent financial early warning.

## 2. Current Status and Main Features of Deepseek Research

DeepSeek's rapid growth history fully reflects the speed of China in bending the road to overtake the others. Initially, the DeepSeek team focused on basic technology development, including Natural Language Processing (NLP) and multimodal data processing technology. In January 2024, the DeepSeek team released the first large language model, DeepSeek LLM, which demonstrated powerful text generation and language understanding capabilities, laying the foundation for the development of subsequent products. Since then, the DeepSeek team has released multiple versions of the model, including DeepSeek Coder (code generation model), DeepSeek Math (mathematical problem solving model), and DeepSeek VL (multimodal model), demonstrating the maturity of the technology and its rapid adoption, as well as fostering the formation of a community of developers. January 2025 DeepSeek-R1 model landed on NVIDIA NIM platform, and Microsoft Azure, AWS Bedrock and other overseas platforms have accessed it. In February of the same year, DeepSeek-R1, V3, Coder and other models went online on the National Supercomputing Internet Platform, further expanding their application scenarios and reflecting China's rapid rise and technological innovation in the field of artificial intelligence.

### 2.1. Status of Research

DeepSeek's technological innovation and market performance provide a new direction for the popularization and application of AI technology. In terms of technological innovation and model iteration, DeepSeek focuses on model architecture optimization, training efficiency enhancement, and multimodal fusion performance, supporting.

The FP8 mixed precision training, Mixed Mixture of Experts (MoE) architecture, and Multiple Latent Attention (MLA) technology<sup>[1]</sup>, which significantly reduces memory usage and computational resource consumption by reducing the data bit-width, are dedicated to dramatically reducing the amount of computation and communication as well as increasing the training speed. Meanwhile, DualPipe bidirectional pipeline technology is utilized to make GPU utilization break through the industry bottleneck of 85%, which significantly reduces the cost

of model training and inference, and exhibits good technical innovation efficacy. In terms of global influence and market performance, DeepSeek breaks through the traditional AI research and development mode and adopts the "model-tool-dataset" full-stack open source system, which reduces the threshold of AGI research and development and at the same time makes the API pricing only one-twenty-seven percent of the industry benchmark, and has a strong momentum in the market competition with its significant cost and performance advantages. With significant cost and performance advantages in the market competition, DeepSeek has a strong momentum. It can be seen that DeepSeek's low-cost, high-performance models and extensive open-source ecology are expected to enhance the popularization of AI technology applications.

DeepSeek demonstrates significant advantages in terms of usage efficiency, and is expected to overcome the technical difficulties of traditional AI applications. DeepSeek is different from previous AI technologies in terms of localized deployment, arithmetic requirements and response speed<sup>[2]</sup>. First, localized deployment can significantly reduce the dependence of enterprise financial warning on cloud services, avoid the delay of data transmission, and improve the response speed of the system. For example, the Three Gorges Hospital of Chongqing University, by locally deploying DeepSeek, has successfully ensured the security of medical data, and has also realized the second response of condition analysis, report interpretation and other functions. Second, DeepSeek significantly reduces the demand for hardware resources by optimizing the algorithmic architecture. For example, DeepSeek-V3 adopts hybrid expert architecture and 8-bit floating-point mixed-precision training, which optimizes memory and computational efficiency and reduces training costs. This low computing power requirement enables DeepSeek to be widely used in resource-limited scenarios, such as financial alerts for SMEs and grassroots organizations. Third, DeepSeek V3 supports text generation, multi-round dialog, sentiment analysis and knowledge quiz, and supports multi-language interaction. This efficient language processing capability enables DeepSeek to respond quickly to user needs and provide accurate services. Therefore, it is feasible to apply DeepSeek to financial early warning for SMEs.

## 2.2. Main Features

(1) Focus on algorithmic innovation. DeepSeek adopts advanced model architectures, such as hybrid expert architecture and multi-head potential attention mechanism, which significantly improve computational efficiency and performance. DeepSeek-V3 optimizes memory and computation by 8-bit floating-point mixed-precision training, which reduces the training cost; DeepSeek R1-Zero adopts a group-relative strategy to optimize reinforcement learning, skipping the inherent patterns of traditional AI supervised fine-tuning and human feedback, and improving reasoning and self-learning capabilities. These algorithmic innovations have enabled DeepSeek to set industry benchmarks in performance, efficiency and cost control.

(2) Efficient and intelligent machine learning technology. Machine learning can provide financial early warning with the ability to change from "static lag" to "dynamic foresight". DeepSeek can update the model based on real-time data streams (e.g., daily transaction data, changes in public opinion) to shorten the traditional financial analysis cycle (quarterly/annual) and achieve "weeks to months in advance" warning. DeepSeek can update models based on real-time data streams (e.g. daily transaction data, public opinion changes), shorten the traditional financial analysis cycle (quarterly/annual), and realize "weeks to months in advance" warning. At the same time, DeepSeek can adapt to changes in the market environment (e.g., economic policy adjustments, industry fluctuations) through Online Learning or Migration Learning to maintain the long-term effectiveness of the early warning system.

(3) Multimodal Data Processing Capability: DeepSeek is able to process multiple data types such as images, text, audio, etc., and integrate structured and unstructured data (e.g., financial

statements, market dynamics, etc.) from both internal and external sources, which provides a more comprehensive view of the risk events, which is a significant advantage when dealing with complex tasks. In addition, DeepSeek VL supports image description generation, visual Q&A, cross-modal retrieval, etc., providing users with multimodal content creation and editing services. This multimodal data processing capability provides SMEs with the possibility to efficiently manage and retrieve multimodal resources for financial alerts.

(4) Powerful Natural Language Processing Capability: DeepSeek excels in natural language processing, supporting text generation, multi-round dialog, sentiment analysis, knowledge quiz and other functions, as well as multi-language interactions, and is able to understand contextual semantics and generate high-quality and diversified text content. At the same time, DeepSeek's code, data and algorithms are open to the public and support technical analysis and secondary development, providing the necessary technical foundation for SMEs and social organizations to conduct in-depth reviews of their financial status and ensure that their financial early warning models are safe and compliant.

### 3. Adaptation Analysis of DeepSeek in Financial Early Warning

#### 3.1. Deepseek Main Application System

DeepSeek, as a lightweight, algorithm-optimized and open-source-supported AI platform, has core models and functions that can be adapted to financial early warning scenarios, and the specific application system is shown in [Table 1](#).

**Table 1.** DeepSeek Application System in Financial Early Warning

| Application Name | Key Features                                                                                                                           | Financial Alert Adaptation Direction                                                                                                                                           |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DeepSeek R1      | Multimodal data fusion, petabyte-scale data processing, intelligent decision support and cross-domain knowledge mining. <sup>[3]</sup> | It is suitable for real-time processing and complex pattern recognition of corporate financial big data, and supports the training and optimization of dynamic warning models. |
| DeepSeek V3      | Natural Language Processing (NLP), Text Generation, Multi-Round Dialogue and Knowledge Quiz.                                           | Generate financial risk analysis reports, automate answers to decision makers' questions, and improve the interpretability and interactivity of early warning results.         |
| DeepSeek LLM     | Massive text training, multilingual processing and semantic understanding, support for domain customization.                           | Analyze unstructured data such as financial reports and news and public opinion to uncover potential risk signals.                                                             |
| DeepSeek Coder   | Code generation and optimization to support programming logic implementation.                                                          | Rapid development of financial alert algorithm modules and optimization of model deployment processes.                                                                         |
| DeepSeek Math    | Math formula identification and solution step generation.                                                                              | Auxiliary financial indicator calculations (e.g., Z-Score, cash flow ratios, etc.) validate the mathematical rigor of the model logic.                                         |

DeepSeek covers the whole process of financial early warning through the synergy of five application systems: from data collection (R1, LLM), algorithm development (Coder), indicator validation (Math) to decision support (V3), forming a closed-loop management<sup>[4]</sup>. Its lightweight architecture, dynamic iteration capabilities (e.g., online learning technology) and cross-industry migration features (e.g., model migration from manufacturing to retailing) not only adapt to the complex scenarios of large enterprises, but also flexibly serve the

differentiated needs of small and medium-sized enterprises, providing intelligent, high-precision, and implementable solutions for financial risk management.

## **4. Financial Early Warning Deepseek Application Technology Route Design**

In this study, the Technology Acceptance Model (hereinafter referred to as "TAM") is used for the design of the technical route of the DeepSeek application for financial alerting, because TAM is a key factor in explaining user acceptance of new technologies in terms of new technology adoption, and the analysis mainly includes perceived usefulness and perceived ease of use.

### **4.1. Program Design based on the Technology Acceptance Model (TAM)**

#### **4.1.1. Exploring the Program Design of TAM from the Perspective of Perceived Usefulness**

Improve Financial Early Warning AI Analysis with Multimodal Data Processing Capabilities  
DeepSeek is able to deeply mine and analyze massive financial data to quickly identify potential financial risks through its powerful natural language processing and data analysis capabilities. For example, DeepSeek can be used to analyze multiple sources of data, such as an enterprise's financial statements, cash flow, market dynamics, etc., to accurately predict the probability of a financial crisis, thus helping financial decision makers take measures in advance to avoid or reduce losses. In terms of improving decision-making efficiency, DeepSeek can process and analyze data in real time to provide dynamic early warning information. Compared with traditional financial early warning models, it not only responds quickly to market changes, but also adjusts early warning strategies based on real-time data, providing financial decision makers with more timely and accurate decision-making support and significantly improving decision-making efficiency.

In terms of enhancing risk management capabilities, DeepSeek can combine historical and real-time data to build dynamic financial risk assessment models. It can identify the complex relationships between different financial indicators and continuously optimize the model through machine learning algorithms to more comprehensively assess the financial health of an enterprise and enhance overall risk management capabilities<sup>[5]</sup>. Meanwhile, DeepSeek is able to extract valuable information from a large amount of financial data and generate knowledge graphs or summaries to help financial staff better understand the changing trends of an organization's financial situation. This knowledge discovery function not only enhances the professional capabilities of finance staff, but also promotes knowledge sharing and collaborative work within the organization.

#### **4.1.2. Exploring the Program Design of TAM from the Perspective of Perceived Ease of Use**

Leveraging algorithmic innovations to customize personalized AI financial alert models, DeepSeek supports localized deployment and is able to adapt to different enterprises' technical environments and data privacy requirements. Enterprises can deploy DeepSeek on local servers according to their own needs without relying on external cloud services, thus reducing the risk of data leakage, as well as reducing the reliance on complex IT infrastructure and lowering the threshold of use. In terms of user interaction, DeepSeek provides natural language interaction, so finance staff can interact with the system through a simple dialog to obtain early warning information and analysis results. This intuitive interaction does not require complex operational skills, making the system easy to use for non-technical finance staff and improving its ease of use.

In terms of flexible customization capability, DeepSeek can be customized and developed according to the specific needs of enterprises. Enterprises can adjust and optimize DeepSeek's

early warning model according to their own financial indicator system and business processes, making it more closely match the actual business scenarios. This flexibility allows companies to quickly adapt to market changes and technology updates, further enhancing the system's ease of use and practicality<sup>[6]</sup>. Meanwhile, DeepSeek can automatically complete data cleaning, mining and analysis, reducing the workload of financial staff in data processing. It can automatically identify anomalies and risk factors in the data through preset algorithms and models, and generate early warning reports, enabling financial staff to focus more on decision-making and countermeasures.

#### **4.1.3. Generative Artificial Intelligence Technology Route for Financial Early Warning with Deepseek as the Core**

The financial early warning generative AI technology route centered on DeepSeek can be divided into three main levels: data layer, algorithm layer and application layer. Through the synergistic work of these three layers, intelligent identification, dynamic early warning and efficient management of financial risks are realized.

#### **4.1.4. Financial Alert Generative Artificial Intelligence Technology Route Data Layer Design (Deepseek Information)**

The data layer focuses on data integration and pre-processing. The data of SMEs mainly includes financial data (integrating the enterprise's financial statement data as well as financial indicator data), non-financial data (including the enterprise's business data, market data, macroeconomic data, and internal management data, etc.), and multimodal data (the enterprise's promotional videos, product pictures, social media data, etc.), which can be used to analyze the enterprise's operating conditions in a more comprehensive way. After collecting the relevant data, data preprocessing for financial early warning information is performed, including data cleaning (removing duplicate data, correcting erroneous data, and filling in missing values), data standardization (converting data from different sources into a unified format and standard), feature extraction (using DeepSeek's natural language processing and multimodal data processing capabilities to extract valuable information from text, images, audio, and other data), as inputs to the financial early warning model, and as inputs to the financial warning model. information as input features for financial early warning models)<sup>[7]</sup>.

#### **4.1.5. Algorithmic Layer Design for Financial Alert Generative Artificial Intelligence Technology Route (Deepseek Analysis)**

The algorithm layer focuses on risk identification and early warning model construction. In terms of risk identification, DeepSeek's multimodal processing capabilities (e.g., DeepSeek VL) can be utilized to fuse and analyze financial data, text data, image data, etc. to identify potential financial risk factors. For example, by analyzing the text of an enterprise's financial statements and related images (e.g., photos of factory equipment), it can make a comprehensive judgment of the enterprise's operating conditions. At the same time, DeepSeek V3 and other models are used to semantically analyze text data such as financial reports, news reports, management discussions and analysis of enterprises to extract key information, such as negative news and management's concerns about the future, as an important basis for risk identification. And we combine traditional machine learning algorithms (e.g., logistic regression, support vector machine) and deep learning algorithms (e.g., neural network, recurrent neural network) to construct hybrid models to improve the accuracy and robustness of risk identification.

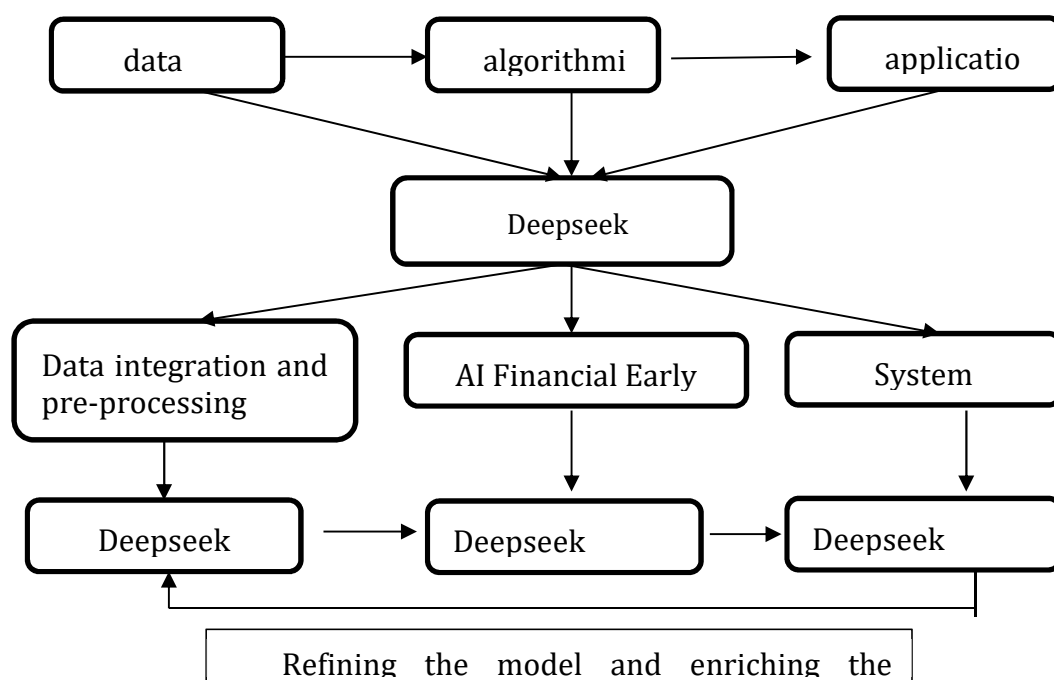
In terms of dynamic early warning models, time-series analysis methods can be introduced, combined with DeepSeek's dynamic adjustment capabilities, to monitor an enterprise's financial indicators and business data in real time and predict future trends in financial conditions. For example, by analyzing the monthly cash flow data of the enterprise, it can predict the risk of possible future shortage of funds. It is supplemented by a dynamic adjustment mechanism, which dynamically adjusts the parameters and thresholds of the early

warning model based on real-time data to ensure that the model can adapt to market changes and changes in the business environment of the enterprise. For example, when the market interest rate fluctuates significantly, the relevant parameters in the financial risk early warning model are automatically adjusted to improve the timeliness and accuracy of the early warning.

#### 4.1.6. Application Layer Design (Deepseek Model) for the Financial Alert Generative AI Technology Route

The application layer focuses on intelligent early warning system development and application. In terms of intelligent early warning system development, a cloud-based financial early warning model can be constructed, including data acquisition module, data processing module, risk identification module, early warning module and user interaction module<sup>[8]</sup>. Take advantage of DeepSeek's technology to realize the intelligence and automation of the system. It also designs an intuitive and easy-to-use user interface that allows financial staff to easily view early warning results, analysis reports and risk alerts. At the same time, provide interactive functions that allow users to adjust and optimize the model. DeepSeek's text generation capability can also be utilized to automatically generate financial risk analysis reports and early warning reports to provide management with decision support.

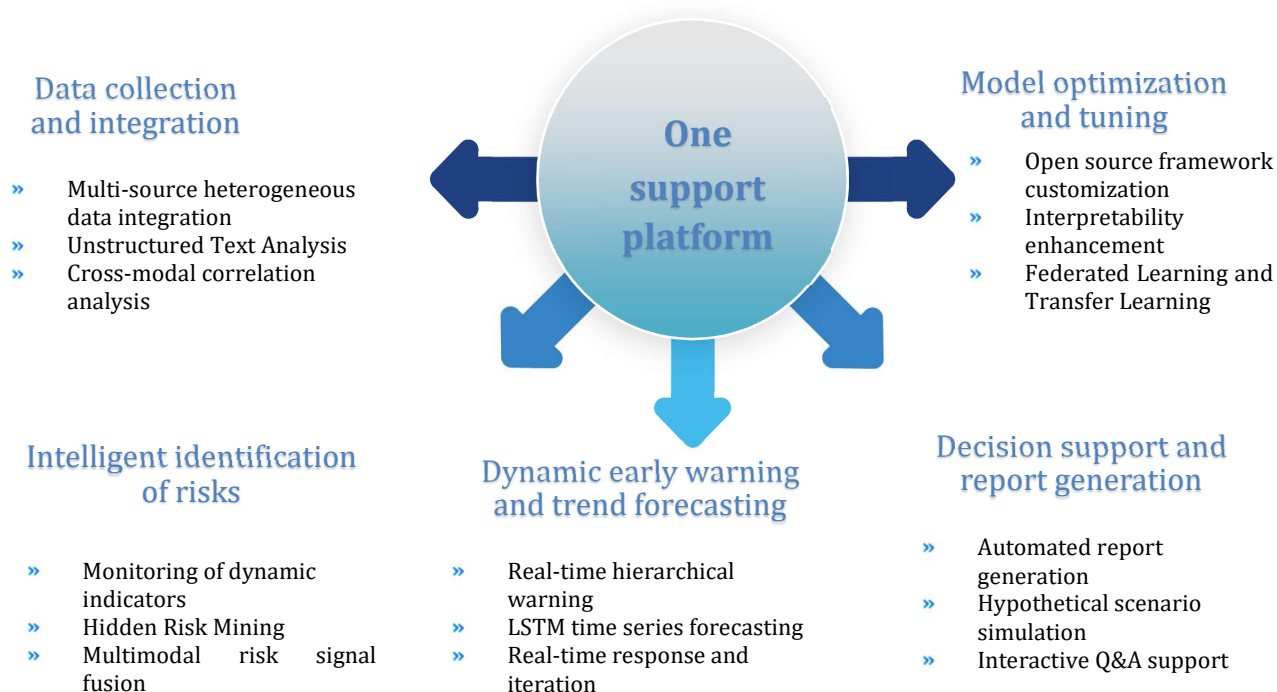
In terms of application scenarios, real-time risk monitoring is required. Using the financial early warning system to monitor the enterprise's financial data and business data in real time, an early warning signal will be issued as soon as a potential risk is found and the financial decision-maker will be notified via SMS, email, and other means. And according to the enterprise's industry characteristics, scale of operation and risk appetite, to provide personalized risk warning services. For example, for manufacturing enterprises, focus on inventory turnover and equipment utilization; for financial enterprises, focus on credit risk and market risk. DeepSeek's knowledge graph construction capability can also be combined to provide enterprises with information on industry dynamics, competitor analysis, macroeconomic situation, etc., to help management make more scientific decisions. The specific application route is shown in [Figure1](#).



**Figure 1.** Technical route to the Deepseek application for financial early warning

## 5. DeepSeek's Financial Early Warning "1+5+N" PUD Application System

"1" refers to the support platform, DeepSeek, and "5" refers to the five core application directions. As shown in Figure 2, the application system includes five core directions: data collection and fusion, intelligent identification of risks, dynamic early warning and trend prediction, decision support and report generation, and model optimization and adjustment, and "N" refers to several specific applications. Through the in-depth integration of the "1+5+N" PDU system, DeepSeek realizes a closed loop from data collection, risk identification, dynamic early warning to decision support, covering the whole life cycle of financial early warning<sup>[9]</sup>. Its core advantages lie in its multimodal data fusion capability, dynamic model iteration efficiency and industry customization flexibility, providing intelligent and interpretable financial risk management tools for SMEs, financial institutions and government departments. The application system framework is shown in [Figure 2](#).



**Figure 2.** DeepSeek's Financial Early Warning Application System Diagram

### 5.1. "1" Core Platform - Support Platform DeepSeek (Platform)

#### 5.1.1. Platform Architecture and Functionality

DeepSeek platform builds a complete service system through four core modules to realize seamless connection with enterprise operation system. Specifically, the platform includes four functional modules: platform integrated data access layer, model training layer, early warning push layer and visualization and analysis layer, and each module realizes loosely-coupled interaction through APIs, so that the modules can be combined freely according to the needs of enterprises. Based on flexible scalability, the platform not only realizes two-way data interoperability with mainstream financial software (e.g. SAP/User Friendship/Kingdee), but also adapts to new equipment through code plug-ins developed by DeepSeek Coder, and integrates with business analytics tools to realize real-time data updates. In terms of security, the platform adopts nationally certified encryption algorithms to guarantee the security of data transmission, and supports local server deployment to ensure data sovereignty, as well as private cloud/hybrid cloud programs to meet the needs of enterprises of different sizes<sup>[10]</sup>.

What deserves special attention is that the federal learning solution launched for small and medium-sized enterprises can not only share key data features to assist modeling under the condition of complete isolation of the original data, but also significantly reduce the threshold of technology application, ultimately providing enterprises with a full chain of intelligent services from risk identification to decision support<sup>[11]</sup>.

## 5.2. "5" Large Core Application Direction (Direction)

Data collection and fusion, intelligent identification of risks, dynamic early warning and trend forecasting, decision support and report generation, model optimization and adjustment.

## 5.3. "N" Vertical Scenario Applications (Use)

Vertical scenario specific applications are shown in Table 2.

**Table 2.** DeepSeek Vertical Scenario Applications

| application direction                       | technical support                                                                                           | Scenario Applications                                                                                                                                                                                                                                                                                                  |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data collection and integration             | Multi-source heterogeneous data integration, unstructured text analysis, cross-modal correlation analysis   | A manufacturing company integrates ERP system order data and external public opinion data through DeepSeek VL and finds that a core supplier has been penalized for environmental issues, triggering a supply chain risk warning and switching to an alternative supplier in advance to avoid production interruption. |
| Intelligent identification of risks         | Dynamic indicator monitoring, implicit risk mining, multimodal risk signal fusion                           | A financial institution utilized DeepSeek R1 to monitor the "cash ratio" and "quick ratio" of a lending company in real time, and found that the indicators of a company had declined for two consecutive quarters, which triggered the post-credit checking process and lowered the bad debt rate by 15%.             |
| Dynamic early warning and trend forecasting | Hierarchical Early Warning Mechanisms, LSTM Time Series Prediction, Real-Time Response and Iteration        | An auto parts supplier has sudden operational abnormalities, and the platform predicts its downstream OEM's cash flow risk in the next 3 months through LSTM, and freezes the credit line in advance to avoid chain defaults.                                                                                          |
| Decision support and report generation      | Automated report generation, what-if scenario simulation, interactive Q&A support                           | Nanchong Municipal Finance Bureau utilized DeepSeek V3 to batch screen 500 enterprises and automatically flagged 12 enterprises with inflated revenues (e.g., >30% deviation between revenues and taxes paid), which aided in increasing audit efficiency by 70%.                                                      |
| Model optimization and tuning               | Open Source Framework Customization, Interpretability Enhancement, Federated Learning and Transfer Learning | A rural cooperative quickly adapted a trained manufacturing risk model to an agricultural scenario by adding a "drought index" factor through migratory learning technology, increasing the sensitivity of early warning by 35%.                                                                                       |

### (1) Applications geared towards "data collection and fusion"

Multi-source Heterogeneous Data Integration: DeepSeek VL builds a panoramic risk portrait of enterprises through cross-modal retrieval technology, which centers on bridging the semantic gap between structured and unstructured data. The system adopts a multimodal alignment strategy to map the financial indicators in balance sheets, the time-series dynamics of supply chain orders, and the emotional polarity of news and public opinion into a unified feature space,

and quantifies the data value through adaptive weight allocation. For example, for retail enterprise scenarios, the system can synchronously integrate store sales flow (structured), social media word-of-mouth evaluation (unstructured) and logistics time-series data (time-series) to build a monitoring system covering the whole chain of "finance-operation-market"<sup>[12]</sup>.

Unstructured text analysis: DeepSeek LLM builds a risk knowledge engine based on deep semantic understanding, which is innovative in extracting computable risk signals from massive text. Through pre-training and fine-tuning of paradigms, the system adapts the model to the terminology used in the financial field, and when parsing the "Management Discussion" section of the annual report, the system can identify the substantive risks behind the ambiguous expressions, such as automatically labeling the "existence of a certain amount of pressure on the collection of money" as "abnormal turnover of accounts receivable". At the same time, combined with event extraction technology, the system extracts key events such as "prolongation of suppliers' billing period" and "reduction of major customers' orders" from the minutes of the meeting, and aligns them with the accounts payable turnover rate and revenue growth rate of the financial system to form a dynamic monitoring map of risk events.

Cross-modal correlation analysis. The knowledge graph-driven risk inference engine is the decision-making core of the system, deepseek R1, by constructing a causal network of "financial indicators - business parameters - external events", it identifies compound risks that are difficult to capture by traditional methods. The system adopts graph embedding technology to map business indicators such as inventory turnover rate and order fulfillment rate to high-dimensional vectors with financial data such as cash flow and gearing ratio, and identifies abnormal correlation patterns through similarity metrics. For example, under the surface health data of 20% year-on-year revenue growth of a manufacturing company, the system warns of supply chain stability risks in advance through signals such as a 300% surge in litigation volume of associated suppliers and a 65% extension of raw material inventory turnover days<sup>[13]</sup>. This cross-modal correlation analysis capability upgrades financial risk early warning from a single outcome judgment to a full-process dynamic diagnosis.

## (2) Applications for "Intelligent Risk Identification"

Dynamic indicator monitoring. The intelligent risk control system built on DeepSeek R1 multimodal data processing platform dynamically monitors core financial indicators such as KZ and Z-Score indexes through a real-time streaming computing engine. The system adopts a dynamic threshold algorithm to adjust the warning thresholds by combining the industry characteristics with the business cycle of the enterprise. When the KZ index of an enterprise is below the set threshold for three consecutive months, the system triggers a graded early warning mechanism and links the cash flow analysis and supply chain risk assessment modules to realize early capture and multi-dimensional validation of risk signals, avoiding the lagging problem of static models. At the same time, the system realizes the intelligent identification of Z-Score through a three-stage logic: firstly, relying on the hybrid precision architecture and federated learning technology, it integrates the financial statements, supply chain time series data and industry dynamics in real time, and completes the key index extraction with a processing capacity of 2,500+ transaction streams per second on a single NVIDIA A100 GPU server through adaptive feature extraction of the MoE sparse model; secondly, it adopts Dynamic Bayesian model to extract key indicators; secondly, it adopts Dynamic Bayesian model to extract key indicators through dynamic Bayesian model. indicators extraction; secondly, it adopts dynamic Bayesian network algorithm to update the industry benchmark value and fluctuation standard deviation  $\sigma$  online every 72 hours, and calculates the enterprise Z-Score deviation through lightweight comparative learning model, and triggers the judgment condition when the score breaks through the threshold interval of  $1.8 \pm 0.2\sigma$  in 3 consecutive months and the standard deviation of the fluctuation rate is higher than the industry's 25% quartile; and at the same time, combined with the multi-modal fusion diagnostic engine, it

combines the At the same time, combined with the multi-modal fusion diagnostic engine, the financial data are temporally and spatially aligned with unstructured information such as procurement contract texts and logistics delay records, and the anomaly detection model optimized for adversarial training is used to accurately locate the root cause of risk<sup>[14]</sup>.

**Hidden Risk Mining.** Semantic analysis of unstructured text such as management's public statements and internal documents through multi-Token time-series prediction technology to identify decision logic contradictions and potential commitment deviations. Meanwhile, integrating the supply chain database and external event repository, the module utilizes knowledge graph technology to track indirect risk signals such as supplier violations and regional policy changes. By cross-validating financial and non-financial clues, the module enhances the ability to anticipate hidden risks such as strategic adjustments and management turmoil.

### (3) Applications for "dynamic early warning and trend forecasting"

**Real-time hierarchical warning.** Dynamic triggering of early warning based on preset thresholds (e.g. Z-Score model), supporting hourly high-frequency data updates, reserving time for enterprises to dispose of risks. The details of real-time hierarchical early warning are shown in [Table 3](#).

**Table 3.** Classified warning

| risk level     | Trigger conditions (example)                                             | Disposal recommendations                     |
|----------------|--------------------------------------------------------------------------|----------------------------------------------|
| red (color)    | $Z\text{-Score} < 1.2$ and negative cash flow                            | Immediate commencement of debt restructuring |
| orange (color) | $1.2 \leq Z\text{-Score} < 1.8$ or negative public opinion rate $> 40\%$ | Reduction of capital expenditure             |
| yellow (color) | $1.8 \leq Z\text{-Score} < 2.6$ or a 50% plunge in R&D investment        | Enhanced cash flow monitoring                |

**LSTM time series forecasting.** It predicts the future probability of bankruptcy and cash flow trend of enterprises, and generates proposals for relief programs (e.g., debt restructuring, issuance of additional shares), realizing the shift from "after-the-fact response" to "before-the-fact prevention".

**Real-time response and iteration.** Adopt online learning framework to build a flexible risk control system, and access financial report data, public opinion events and industry chain fluctuation signals in real time through microservice architecture. The incremental training mechanism is designed to automatically fuse new samples to update LSTM model parameters every quarter, and unexpected events trigger instant model hot updates. When a major risk event (e.g. loss of a major customer) occurs, the system completes cash flow revaluation and Z-Score recalculation within one hour, dynamically adjusts the warning threshold and triggers emergency response links (e.g. freezing credit limits, initiating emergency due diligence process), and at the same time, through the API, links with the ERP and fund management systems to implement liquidity protection measures (e.g. instructions for accelerating the return of accounts receivable)<sup>[15]</sup>.

### (4) Applications for "Decision Support and Report Generation"

**Automated Report Generation:** DeepSeek V3 generates multi-language risk analysis reports with visual charts such as heat maps and trend charts, and supports multi-dimensional risk comparisons (e.g., industry risk distribution, historical trends).

Hypothetical Scenario Simulation. Simulate the impact of different financing strategies on risk levels (e.g., short-term borrowing vs. equity financing) to aid dynamic decision optimization.

Interactive Q&A support. Natural Language Processing (NLP) technology enables decision makers to query risk details (e.g., "probability of insolvency in the next 6 months") in a conversational format and generate visual explanations.

#### (5) Applications for "Model Optimization and Adjustment"

Open source framework customization. Based on DeepSeek open source code, adjust the weight of risk indicators for different industries (e.g. manufacturing industry to strengthen "inventory turnover ratio", retail industry to focus on "cash flow ratio").

Interpretability Enhancement. The SHAP tool parses the model determination logic to enhance the trust of financial decision makers in AI early warning results.

Federated Learning and Migration Learning. Supports cross-industry model migration (e.g., from manufacturing to retail), requiring only fine-tuning of non-financial indicator weights and reducing data labeling costs.

## 6. Problems and Prospects

### 6.1. Practical Contradiction between Arithmetic Demand and Localized Deployment

Although DeepSeek supports lightweight deployments (e.g., DeepSeek-V3's hybrid expert architecture), enterprise-level core models (e.g., DeepSeek R1) still require high-performance hardware support. For example, "the full-blooded version of DeepSeek R1 requires dual H100 GPUs and 1TB of RAM, and 8 A100 80G server clusters are recommended", which puts a huge pressure on SMBs' IT infrastructures, and the cost of hardware purchase, maintenance and energy consumption may be beyond their affordability. By designing a cloud computing resource sharing program for the needs of SMEs, under this model, SMEs can rent high-performance computing resources on demand to run the DeepSeek model, which not only meets the arithmetic demand but also avoids high hardware procurement costs.

### 6.2. Technical Bottlenecks in Multimodal Data Governance

DeepSeek VL can integrate structured financial data (e.g., income statement) with unstructured data (e.g., public opinion news, photos of factory equipment), but it has not solved the challenges of cleansing, aligning and fusing data from multiple sources. For example, the semantic analysis of management meeting minutes needs to rely on NLP technology, while the lack of standardized rules for correlating image data (e.g., photos of production lines) with financial indicators may lead to hidden risk misjudgment. First and foremost, R&D should be strengthened to develop more advanced automated multi-source data cleansing, alignment and fusion tools. At the same time, with the wide application of multimodal data in various industries, unified industry standards can be formulated to standardize the format and semantic representation of multimodal data, making it possible for systems like DeepSeek to have a basis for multimodal data processing and reducing the possibility of implicit risk misjudgment.

### 6.3. Inadequate Scenario Adaptation of Dynamic Early Warning Models

Dynamic early warning models rely on real-time data to adjust parameters, but insufficient historical data may lead to model failure during sudden events (e.g., supply chain disruptions due to epidemics). When encountering sudden events that result in insufficient historical data, model training data can be supplemented by generating relevant data through simulation. For example, techniques such as Generative Adversarial Networks (GAN) are utilized to generate scenario data similar to the unexpected event to improve model adaptability. Cross-domain

data fusion can also be used to introduce data features from different domains into the financial early warning model to broaden the knowledge of the model so that it can make reasonable warnings under more special scenarios.

#### **6.4. Lagging Behind in the Construction of Exclusive Data Systems for SMEs**

When using DeepSeek for dynamic financial risk early warning, it is recommended that localized deployment enterprises have a complete data system, but data fragmentation is common in SMEs. For example, retail enterprise financial data is scattered in ERP, Excel and manual ledgers, and lacks the ability to annotate multimodal data (e.g., store surveillance video), resulting in low quality model inputs. Data integration service providers can launch customized data integration solutions for SMEs to help them sort out data processes, establish standard data formats and storage methods, and improve data quality, thus providing a better data foundation for the application of DeepSeek and other technologies.

### **7. Conclusion**

DeepSeek's application in enterprise intelligent financial early warning is mainly through the "1+5+N" application system, integrating multimodal data processing, dynamic early warning models and other technologies to realize real-time monitoring, risk identification and trend prediction. The system covers the processes of data collection, algorithm development, indicator validation and decision support, and can be flexibly adapted to the needs of large enterprises and small and medium-sized enterprises. Despite rapid technological innovation, challenges include dependence on high-performance hardware, bottlenecks in multimodal data cleansing and fusion, and insufficient adaptability of dynamic warning models to unexpected events. It is recommended that the technology be promoted and applied through arithmetic sharing, industry standardization, and cross-domain data fusion. This research provides a useful reference framework for intelligent financial early warning.

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