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Financial Risk Early Warning Model Combining SMOTE and Random Forest for Internet Finance Companies

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ABSTRACT

At present, there have been many achievements on enterprise financial risk early warning model, but relatively few early warning studies focusing on the Internet industry. Research shows that the model has stable recognition accuracy and good prediction performance. The improved SMOTE algorithm based on PCA can realize the equalization of unbalanced data sets and use random forest as a classifier to classify and predict geological data. Because the noise data in the original data set may cause the change of the data distribution after interpolation, it is proposed to combine the PCA algorithm and the SMOTE algorithm, first perform noise reduction and dimension reduction, and then perform data interpolation to improve the classification performance of imbalanced data sets. my country's Internet financial listed companies conduct experiments on research samples, algorithm can better improve the classification accuracy and provide new ideas for the classification and prediction of unbalanced data.

KEYWORDS

Financial Risk Early Warning, Random Forest, SMOTE Algorithm

INTRODUCTION

Internet finance is a tool that leverages electronic payment and third-party platforms to realize a new financial model of funds management (Lin, 2022; Shahrokhi, 2008). Compared with traditional financial models, internet finance is distinct (Zeng, 2022; Zetzsche et al., 2020), in that it utilizes robust, back-end systems and information technology to offer a broader range of services, as well as offer more optimized products (Zhang & Luo, 2022). The brief development timeline of China's internet finance sector, however, along with significant issues regarding network security, have resulted in relatively underdeveloped risk management strategies, and imperfect supervisory frameworks, indicating ample room for healthier growth (Li, 2022; Song et al., 2023).

Since the emergence of finance as an industry in China, traditional finance has led development. It has, however, been constrained by certain, inherent characteristics (Yue, 2021; Allioui & Mourdi, 2023). Traditional financial institutions, such as banks, have fixed transaction locations, yet cannot facilitate remote transactions (Wu et al., 2021). They can serve users, but typically charge fees for these services (Olawale et al., 2023). However, innovations have emerged. Through digital platforms, traditional financial transactions can be streamlined—order executions, transaction information

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queries, and online customer service have all reduced costs significantly for financial institutions (Ionescu & Diaconita, 2023).

The operational models of traditional financial businesses on internet-based platforms include two main forms: one is an independent operation model, primarily involving cooperation with other enterprises via the internet; the other is a platform operation model, mainly based on website operations (Madanaguli et al., 2023).

The transaction process of the financial service model based on internet platforms is entirely dependent on the web (Liu et al., 2022). Such online trading platforms are vast and attract a wide user base, ranging from corporations to individuals (Zhang, 2022). On these platforms, continuous information flow enables investors and financiers to conduct financial transactions quickly and conveniently (Xiao, 2022). This internet platform structure transforms traditional financial models by enabling novel trading methods that rely solely on online transactions, such as peer-to-peer lending (Chen, 2022). Trading through this model is flexible and expedient, making it an attractive option for investors and financiers alike (Wang & Wang, 2022).

The new internet financial model is not merely a financial business; it is a third-party payment platform that provides internet-based financial support (Tan, 2022). Financial services appear in various forms, both offline and online; offline financial service functions are fully integrated into the internet (Liu et al., 2021). As customers receive information about diverse transaction services, their understanding of these services increases accordingly (Srinadi et al., 2023). This integration and coordination between financial institutions and customers significantly enhances the efficiency of internet-based financial support (Qiu, 2021). This efficient, internet-based financial support model also helps reduce information asymmetry between institutions and customers. Additionally, it promotes innovation in internet financial services, and optimizes the structure of internet finance (Han et al., 2016).

In internet finance, the protection of information is more stringent; the flow of personal assets and funds cannot be completely transparent (Du et al., 2021). Internet finance, in this aspect, is similar to online banking, which constrains the role and power of banks (Karthik & Krishnan, 2021; Hou et al., 2019; Ahirwar et al., 2020). In short, it prevents banks from accessing information regarding the flow of funds, affecting their capital operations and structures. Information disclosure is a crucial component of internet financial security; without proper disclosure protocol, there can be no security in the digital financial environment. To safeguard the security of users' personal information, internet finance must ensure high levels of transparency in its disclosures. However, due to insufficient transparency, there exists an evident issue of information asymmetry during internet financial transactions. Some companies exploit this asymmetry in order to defraud customers, thereby hindering the healthy development of the internet finance industry as a whole.

Ambiguous and inconsistent regulatory oversight continues to be an ongoing concern. Multiple departments possess direct supervisory and management capabilities, and with each institution having distinct responsibilities, there exist overlapping areas that hinder the rapid development of internet finance. Given the complex and easily accessible nature of information in internet finance, along with the capacity for transactions, some illicit users take advantage of legal loopholes to conduct illegal activities. For instance, they might steal customer information through non-compliant financial portals to perpetrate cybercrimes, ultimately harming customer interests and disrupting the order of China's internet finance sector. The current lack of self-regulation among internet financial companies and platforms has resulted directly in many violations and illegal operations proceeding undetected—and unpunished.

The vital issue of risk control creates a fundamental connection between internet finance and traditional finance. The internet finance industry poses three primary risks: first, market risk; second, network technology risk; third, management and operational risk. Regarding market risk, there are two aspects: government macro-policy interventions in finance, such as monetary policy; and the inherent uncertainty posed by market competition and internet financial bubbles. Due to the less developed