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Analysis of The Relationship Between Financial Fraud Losses and Market Factors

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Abstract. As digital financial services continue to expand, so too does the complexity of financial fraud schemes, affecting both individuals and large corporations. Despite economic growth and increased government attention, the incidence of fraud has not significantly decreased. This study, informed by the Agency Theory of Michael Jensen and William Meckling and Keynesian Economics, investigates the relationship between financial fraud amounts and key market factors such as market volatility, regulatory strength, economic environment, GDP growth rate, and unemployment rate. Through a quantitative analysis of historical data, the study aims to understand how these factors influence the occurrence and scale of financial fraud. Preliminary results indicate a significant correlation only with regulatory strength, suggesting that robust regulatory measures may be crucial in combating fraud. However, the absence of strong correlations with other factors hints at a more complex interplay that warrants further exploration, indicating the need for a nuanced understanding of the dynamics at play in financial fraud.

Keywords: Financial Fraud losses, Market Factors, relationship.

1. Introduction

Financial fraud encompasses a range of deceptive practices designed to secure financial gains through dishonest means. Financial fraud is defined as "deliberate acts of deception aimed at acquiring financial benefits for oneself or causing financial harm to another" [1]. These frauds include various schemes such as Ponzi schemes, insider trading, and identity theft, each exploiting different vulnerabilities within financial systems.

In 2023, financial fraud inflicted losses of nearly $500 billion globally, an amount comparable to the GDP of Singapore [2]. Figure 1 illustrates the global trend in financial fraud losses over the past decade. Data from Global Financial Fraud Losses (2013-2023). Source:Kroll 2023 Fraud and Financial Crime Report [3].

Governments and relevant institutions around the world are continuously increasing their efforts to combat financial fraud. For example, Interpol and the Financial Action Task Force (FATF) have developed new anti-money laundering and counter-terrorism financing standards, and strengthened global cooperation to combat transnational financial crimes [4]. In addition, the European Union launched the "Anti Financial Fraud Action Plan" in 2022, aiming to enhance the transparency and security of the financial system through stricter regulatory frameworks and improved cross-border data sharing [5]. The US Securities and Exchange Commission (SEC) has also launched a dedicated cybersecurity strategy to monitor and combat emerging financial fraud methods [6].

These measures have shown significant effectiveness in theory; however, the amount of financial fraud still shows an increasing trend. For example, according to the 2024 Global Study on Occupational Fraud and Abuse, despite increased investment and stricter policies by countries, the annual total losses from financial fraud have increased by 12% year-on-year [7]. This phenomenon indicates that existing governance measures and investment quotas may not effectively match the actual severity of financial fraud, exposing the inaccuracy of current prediction models. Therefore, there is an urgent need to develop a more accurate predictive model to ensure that countries'

investments in financial fraud prevention and control can match the real level of threat, thereby more effectively curbing the spread of this global problem.

The focus of this study is to explore the relationship between the amount of financial fraud and market factors. We will analyze how factors such as market volatility, regulatory strength, economic environment, Gross Domestic Product (GDP) growth rate, and unemployment rate affect the occurrence and scale of financial fraud. This analysis helps us understand the dynamic changes in financial fraud behavior under different market conditions, as well as the economic principles behind these changes.

By deeply understanding the connection between financial fraud and market factors, we can provide valuable information and insights for financial regulatory agencies, policy makers, financial institutions, and investors. This not only helps to develop more effective preventive measures and regulatory policies to reduce the occurrence of financial fraud, but also helps to raise market participants' awareness of potential risks and make more informed investment decisions. In addition, this study may provide support for financial education and public awareness, further promoting transparency and fairness in financial markets.

2. Literature review

Financial fraud, a pervasive issue in the global economy, has been the subject of extensive study, with various theories attempting to explain its occurrence and implications. One of the foundational concepts in understanding the dynamics of financial fraud is the Agency Theory, proposed by Michael Jensen and William Meckling. This theory examines the conflicts of interest between principals (such as shareholders) and agents (such as company executives), highlighting the information asymmetry and moral hazard that can lead to fraudulent activities [8]. It suggests that the structure of incentives and the effectiveness of corporate governance can significantly influence the likelihood of fraud.

Expanding on this, Keynesian Economics offers a macroeconomic perspective, focusing on the role of aggregate demand and effective regulation in the economy. John Maynard Keynes argued that government intervention, particularly during economic downturns, is crucial for maintaining stability and preventing market failures [9]. In the context of financial fraud, this perspective implies that regulatory policies and economic conditions can either mitigate or exacerbate fraudulent behaviors.

The fraud triangle theory by Donald Cressey complements these economic theories by providing a psychological framework that fraud occurs at the intersection of pressure, opportunity, and rationalization [10]. Cressey's theory underscores the individual motivations behind fraud, which can be exacerbated by the economic pressures emphasized in Keynesian theory and the agency problems outlined by Jensen and Meckling.

Recent studies have endeavored to integrate these theories with empirical data, examining the impact of regulatory environments on financial fraud.

This section reveals a gap in the current understanding of financial fraud, particularly in the context of the complex interplay between individual motivations, corporate governance, and macroeconomic conditions. The present study aims to address this gap by exploring the relationship between financial fraud amounts and key market factors through the lens of Agency Theory and Keynesian Economics, providing a more holistic and nuanced understanding of financial fraud in the modern economy.

Fig. 1 Global finacial fraud losses

3. Relationship Exploring

In order to explore the relationship between the amount of financial fraud and these factors, such a relationship expression can be written:

$$S(t) = \alpha V(t) + \beta R(t) + \gamma E(t) + \delta GDP(t) + \varepsilon U(t) \quad (1)$$

Where $V(t)$ is the market volatility at time; $R(t)$is Regulatory strength at time t; $E(t)$is Economic environment at time t; $GDP(t)$ is GDP growth rate at time t ; $U(t)$ is Unemployment rate at time t.

3.1. Data collection

Table 1 Basic information of the data

Year	Financial Fraud Amount (billion USD)	Market Volatility (%)	AML Index	Regulatory Strength (%)	Inflation (annual %)	Domestic credit to private sector (% of GDP)	Economic Environment (%)	GDP Growth Rate (%)	Unemployment Rate (%)
2013	180	14.82	5.30	47	2.7	118.1	60.4	2.9	6.2
2014	190	14.95	5.70	43	2.4	119.7	61.05	3.1	6
2015	210	17.79	6.50	35	1.4	124.1	62.75	3.1	6
2016	240	16.85	5.97	40.3	1.6	125.9	63.75	2.8	6
2017	280	11.72	6.15	38.5	2.3	126.8	64.55	3.5	5.9
2018	320	18.02	5.63	43.7	2.5	125.5	64	3.3	5.8
2019	370	16.40	5.4	46	2.2	131.2	66.7	2.6	5.6
2020	420	31.48	5.22	47.8	1.9	147.1	74.5	-2.9	6.6
2021	460	21.12	5.3	47	3.4	144.5	73.95	6.3	6
2022	485	27.24	5.25	47.5	8	141.3	74.65	3.1	5.3

As Table 1 shows that, market volatility data is sourced from the Historical Data for Cboe VIX Index [10]. Regulatory strength data comes from the annual reports of Basel AML Index [11]. Economic environment refers to two indicators: Domestic credit to private sector (% of GDP) and inflation rates. Economic environment data is taken from the World Bank's Global Economic Prospects report [12-14]. GDP data comes from the World Bank database [12]. Unemployment rate data is sourced from the International Labour Organization (ILO) and the World Bank [13-15].

Inflation rate data is sourced from the the World Bank [14]. Domestic credit to private sector data is sourced from the the World Bank [15].

Use the following formula to convert AML Index to regulatory strength percentage:

$$R_{\text{percentage}} = \left(1 - \frac{\text{AML Index}}{10}\right) \times 100 \tag{2}$$

We can process these data into a single 'economic environment' percentage indicator. This indicator can be calculated by weighted averaging the inflation rate and changes in private sector credit. The calculation formula is as follows:

$$E = \frac{Inflation + DCTPS}{2} \tag{3}$$

Where DCTPS indicates Domestic credit to private sector.

3.2. Exploring relationships

We assume that the annual change in financial fraud amounts can be approximated as a constant, so we can solve the parameters by accumulating the changes over the year.

The annual change in the amount of financial fraud is:

$$\Delta S = S_{t+1} - S_t \tag{4}$$

The change in market volatility is

$$\Delta V_i = V_i - V_{i-1} \tag{5}$$

The change in regulatory intensity is

$$\Delta R_i = R_i - R_{i-1} \tag{6}$$

The amount of change in the economic environment is

$$\Delta E_i = E_i - E_{i-1} \tag{7}$$

The change in GDP growth rate is

$$\Delta GDP_i = GDP_i - GDP_{i-1} \tag{8}$$

The change in unemployment rate is

$$\Delta U_i = U_i - U_{i-1} \tag{9}$$

By defining these new variables, deformation can be achieved:

$$\Delta S(t) = \alpha \Delta V(t) + \beta \Delta R(t) + \gamma \Delta E(t) + \delta \Delta GDP(t) + \varepsilon \Delta U(t) \tag{10}$$

Besides, such a table can be generated, making it easy to perform multiple regression analysis to solve the parameters (Table 2):

Table 2 Basic information

Year	ΔS	ΔV	ΔR	ΔE	ΔGDP	ΔU
2014	10	0.13	-4	0.65	0.2	-0.2
2015	20	2.84	-8	1.7	0	0
2016	30	-0.94	5.3	1	-0.3	0
2017	40	-5.13	-1.8	0.8	0.7	-0.1
2018	40	6.3	5.2	-0.55	-0.2	-0.1
2019	50	-1.62	2.3	2.7	-0.7	-0.2
2020	50	15.08	1.8	7.8	-5.5	1
2021	40	-10.36	-0.8	-0.55	9.2	-0.6
2022	25	6.12	0.5	0.7	-3.2	-0.7

Table 3 Regression results

	coef	std err	t	P>|t|	[0.025	0.975]
const	26.6609	8.969	2.973	0.059	-1.883	55.205
Delta_V	-0.3747	1.332	-0.281	0.797	-4.615	3.865
Delta_R	2.0211	1.098	1.841	0.163	-1.473	5.515
Delta_E	4.6441	3.770	1.232	0.306	-7.354	16.642
Delta_GDP	1.4177	2.349	0.603	0.589	-6.059	8.894
Delta_U	-2.4819	19.021	-0.130	0.904	-63.015	58.051

After conducting multivariate analysis through code, the parameter values and p values are obtained as follows:

It can be seen that only deltaR has a significant relationship, while other variables do not show a significant relationship with the amount of financial fraud (Table 3).

4. Results

The research findings of this article indicate that among these variables, only the rebound stress has a significant relationship with the amount of financial fraud. However, there is a certain degree of error, which may be due to the fact that the prediction sample data used in the model is only from the past 10 years, some external factors that have not been considered, or simplified assumptions of the model itself. This can be improved by introducing more influencing factors or more sample data to enhance the accuracy of the prediction.

5. Conclusion

We have explored the relationship between various macroeconomic factors and the occurrence of financial fraud. By constructing a predictive model based on historical data, we aimed to estimate the potential impact of market volatility, regulatory strength, economic environment, GDP growth, and unemployment rates on the level of financial fraud. However, the result is that only regulatory strength has a significant impact on the amount of financial fraud

There are several limitations to this study that must be acknowledged. First, the sample size used in the analysis was relatively small, spanning only a decade of data, which may not fully capture long-term trends or the effects of rare, extreme events. Additionally, the model itself is somewhat simplistic, relying on linear relationships between variables that may not accurately reflect the complex, non-linear interactions in the real world.

Looking ahead, future research in this field may benefit from a wider range of datasets, including longer historical periods and more diverse economic environments. In addition, using more complex modeling techniques such as machine learning or nonlinear regression may reveal the relationship

between other variables and the amount of financial fraud. Finally, expanding the scope of analysis to include external factors and their potential interactions with macroeconomic indicators can provide a more comprehensive understanding of the dynamics driving financial fraud.

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