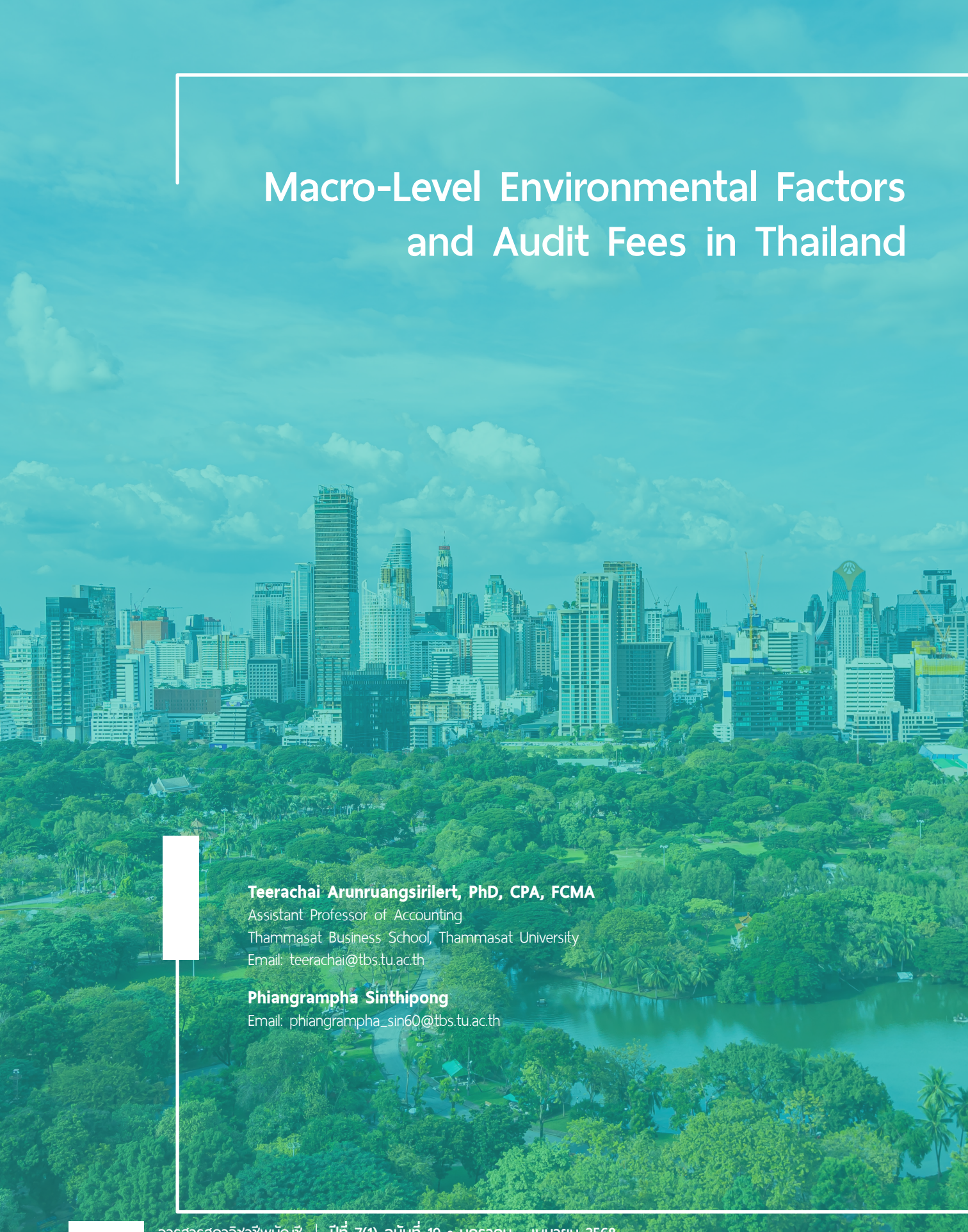
Macro-Level Environmental Factors and Audit Fees in Thailand



Teerachai Arunruangsirilert, PhD, CPA, FCMA
Assistant Professor of Accounting
Thammasat Business School, Thammasat University
Email: teerachai@tbs.tu.ac.th

Phiangrampha Sinthipong
Email: phiangrampha_sin60@tbs.tu.ac.th

Macro-Level Environmental Factors and Audit Fees in Thailand

Teerachai Arunruangsirilert, PhD, CPA, FCMA
Assistant Professor of Accounting
Thammasat Business School, Thammasat University
Email: teerachai@tbs.tu.ac.th

Phiangrampha Sinthipong
Email: phiangrampha_sin60@tbs.tu.ac.th

Received: December 2, 2024
Revised: March 4, 2025
Accepted: April 17, 2025

ABSTRACT

This study examines the relationship between macro-level environmental factors, represented by the PESTEL framework, and audit fees for companies listed on the Stock Exchange of Thailand (SET) in 2020. Using secondary data from 454 listed firms, a multiple linear regression analysis was conducted, with proportional scores calculated for each PESTEL dimension. Results reveal that controlling for industry type significantly enhances the explanatory power of the PESTEL framework. The economic dimension emerged as the strongest determinant of audit fees positively. Conversely, negative technological and legal impacts exhibited differing relationships, underscoring the importance of disaggregated analysis.

Industry-level findings indicate that legal and economic factors are the most influential, followed by social, technological, and COVID-19 impacts. However, environmental factors showed significant relationship with audit fees only for the Industry sector, suggesting context-specific dynamics within Thailand. Political factors demonstrated minimal influence, reflecting limited relevance in audit fee determination.

This research contributes to the literature by highlighting the critical role of macro-level environmental factors in audit fee determination, with implications for practitioners and audit firms. The findings emphasize the need to integrate PESTEL-based insights into audit fee models to account for external risks, ensuring fees reflect the complexities of the auditing environment in Thailand.

Keywords: External environment factors, PESTEL, Audit fees

Introduction

The determination of audit fees is a critical factor influencing both existing and potential clients in their decision to engage auditing services. Simultaneously, it is a significant consideration for auditors and auditing firms when deciding to accept an engagement or to plan the audit process efficiently to achieve optimal outcomes. Importantly, audit fees should not compromise the quality of audit services, which must adhere to professional standards and ethical guidelines. Auditors are expected to maintain audit quality regardless of fee pressures, as mandated by professional integrity.

The Federation of Accounting Professions in Thailand (TFAC) highlighted in Quality Management Standard No. 1 (TSQM 1) that intense price competition in audit fee determination can lead to reductions in fees, potentially affecting audit quality (TFAC, 2023). This concern aligns with a broader discussion in academic literature, initiated by seminal work such as Simunic (1980), who explored factors affecting audit fees in "The Pricing of Audit Services: Theory and Evidence." Simunic's study demonstrated that audit effort, a direct cost of auditing, and litigation risk, an indirect cost, significantly influence audit fees.

Subsequent studies have expanded on Simunic's framework, examining various factors associated with audit fee determination. Traditionally, audit fees are assessed from two primary perspectives: the **Audit Risk Perspective** and the **Demand-Based Perspective** (Lifschutz et al., 2010). However, recent research has incorporated external environmental factors into audit fee analysis. For example, Eierle et al. (2021) conducted a cross-country study that applied **PESTEL Analysis** (Political, Economic, Social, Technological, Environmental, and Legal factors) to explore how external environments affect audit fees. Their findings provided robust statistical evidence of the influence of PESTEL factors on audit fees and highlighted cross-national differences in audit fee determinants.

Building on this foundation, the current study investigates the relationship between external environmental factors, analyzed through PESTEL Analysis, and audit fees in the context of Thailand. Specifically, it focuses on companies listed on the Stock Exchange of Thailand (SET) to determine whether these factors significantly affect audit fees and whether the findings diverge from those in cross-country studies. Thus, the primary objective of this study is to examine the relationship between external environmental factors, as analyzed through PESTEL Analysis, and audit fees for companies listed on the SET. The research aims to provide empirical evidence regarding these relationships within the Thai context and to assess whether these findings differ significantly from existing cross-country evidence. The findings are expected to provide clear evidence of the relationship between external environmental factors, analyzed via PESTEL Analysis, and audit fees in Thailand. These insights will support auditors and audit firms in considering environmental factors when determining audit compensation strategies. Moreover, this study contributes to the understanding of how managerial strategies interact with audit fee determination, offering implications for both practitioners and researchers in accounting and auditing fields.

Literature Review and Hypotheses Development

PESTEL Framework

The PESTEL framework, as discussed by Oxford College of Marketing and Reding in year 2021, serves as both a theoretical model and a practical tool for analyzing macro-level environmental factors. Originating from Francis J. Aguilar's seminal 1967 work , Scanning the Business Environment (Aguilar, 1967) , the PEST analysis initially included four dimensions: Political, Economic, Social, and Technological factors. Over time, Environmental and Legal factors were added, forming the comprehensive PESTEL model (Marmol & Feys, 2015). This framework is widely utilized in strategic planning and business decision-making to identify external threats and opportunities. It also complements SWOT analysis by highlighting environmental dynamics critical to competitiveness and business sustainability (Eierle et al., 2021).

Each dimension of the PESTEL framework offers unique insights into external forces affecting organizational outcomes, including audit fees, which this study investigates.

Political Factors

Political factors encompass government policies, regulatory interventions, and political stability, which can directly impact market dynamics, industries, and businesses. Organizations must navigate political environments shaped by lobbying, regulatory frameworks, and international relations (Ireland et al., 2009). For instance, companies operating in politically active industries often engage in lobbying to influence government actions critical to their economic survival (Hillman & Keim, 2005).

Key political components influencing businesses include tax policies, trade regulations, political stability, and corruption levels (Liu, 2015). Political stability, for instance, correlates strongly with economic growth; instability may hinder growth by fostering uncertainty (Aisen & Veiga, 2013; Zonouzi et al., 2021). Moreover, government interventions, such as wage regulations or welfare spending, also shape business operations (Stack, 2021).

H1: Political factors are significantly associated with audit fees.

Economic Factors

Economic conditions significantly influence business operations and financial planning. Factors such as GDP growth rates, inflation, exchange rates, and unemployment trends dictate economic performance and shape organizational strategies (Marmol & Feys, 2015). For instance, fiscal and monetary policies determine financial liquidity, while market cycles affect consumer spending and business investments (Liu, 2015).

Historical economic crises, including the 2008 financial meltdown and the COVID-19 pandemic, underscore the importance of adapting to economic uncertainties (Ross, 2021). These crises highlight the need for firms to align their financial practices, including auditing, with prevailing economic realities.

H2: Economic factors are significantly associated with audit fees.

Social Factors

Social factors reflect cultural and demographic shifts that influence consumer behavior and business operations. These factors include demographic trends (e.g., income levels, age, and gender), cultural norms, education levels, and social attitudes toward work and consumption (Marmol & Feys, 2015; Eierle et al., 2021).

Recent trends, such as the emergence of the "New Normal" during COVID-19, illustrate how social changes drive demand for flexible business practices (Rahaman et al., 2021). Consumer behavior, shaped by social media and digital engagement, further influences business outcomes (Stack, 2021).

H3: Social factors are significantly associated with audit fees.

Technological Factors

Technological advancements play a pivotal role in reshaping business landscapes. Innovations in information systems, data security, and internet infrastructure have transformed operations and competitive strategies. The integration of advanced technologies, such as RFID in logistics or ERP systems in management, underscores the need for firms to stay technologically agile (Bush, 2016).

Technological factors not only improve operational efficiency but also influence auditing practices. The rising importance of IT capabilities highlights the need for auditing firms to adapt to technological disruptions (Guo et al., 2021).

H4: Technological factors are significantly associated with audit fees.

Environmental Factors

Environmental factors, often associated with ecological concerns, reflect increasing consumer awareness about sustainability and climate change. The growing demand for eco-friendly products and services compels businesses to adopt sustainable practices (Marmol & Feys, 2015). For instance, businesses are investing in green technologies and reducing waste to align with environmental regulations and consumer preferences (Little, 2011).

Environmental concerns also influence corporate reporting and auditing, as firms face scrutiny over environmental compliance and risk management.

H5: Environmental factors are significantly associated with audit fees.

Legal Factors

Legal factors pertain to regulatory frameworks, compliance requirements, and judicial systems affecting business operations. Key aspects include labor laws, trade agreements, and intellectual property protections (Liu, 2015). For example, firms must adhere to labor regulations and minimum wage policies, which can increase operational costs and necessitate rigorous financial auditing (Stack, 2021).

Legal compliance directly affects audit scope and complexity, particularly in industries subject to stringent regulatory oversight.

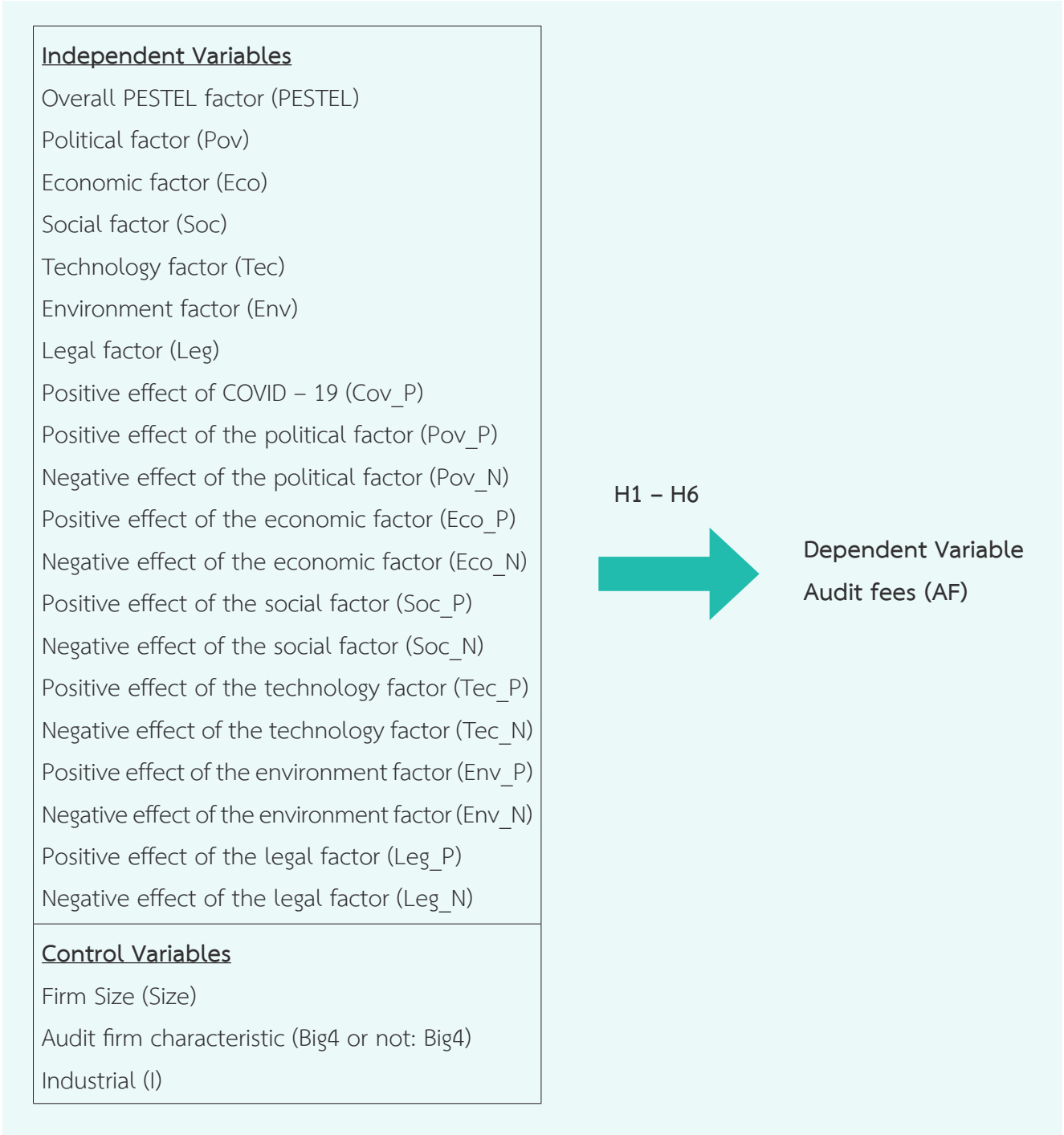
H6: Legal factors are significantly associated with audit fees.

Based on the literature review and hypothesis development, the research framework can be outlined with the independent variables focused on the PESTEL framework. These include the overall PESTEL dimensions (PESTEL), individual components of each PESTEL factor (Pov, Eco, Soc, Tec, Env, Leg, and the positive and negative impacts of each PESTEL component (Pov_P, Pov_N, Eco_P, Eco_N, Soc_P, Soc_N, Tec_P, Tec_N, Env_P, Env_N, Leg_P, and Leg_N) on the company. Additionally, the framework incorporates the situational variable of the COVID-19 pandemic, emphasizing its positive effects on companies (Cov_P).

The control variables in the study include company size (Size), audit firm characteristics (Big4 or not), and industry type. The dependent variable under investigation is the audit fees (AF).

By examining these factors through the PESTEL framework, this study can demonstrate a research conceptual framework as figure 1.

Figure 1 The Research Conceptual Framework



Research Methodology and Modeling

The population for this study comprises companies listed on the Stock Exchange of Thailand (SET) in 2021. The sample group selected for the research consists of all companies listed on the SET in 2020. This selection was made to provide a comprehensive overview of the SET market. However, certain exceptions were applied to refine the sample group.

Specifically, companies that were newly listed on the SET after 2020 were excluded due to incomplete data availability. Firms in the financial sector (classified as FINANCIAL) and investment funds were also excluded, as these entities have unique characteristics, and their audit fee determination may differ significantly from other industries. Additionally, companies with incomplete data relevant to the research objectives were omitted. Examples include missing audit fee information in annual filings such as Form 56-1 or Form 56-2 or insufficient data on external environmental factors.

After applying these exclusions, the final sample size for this study comprises 454 companies. The detailed calculation process is presented in Table 1

The data utilized in this study were secondary data obtained from two key sources: the Annual Registration Statement (Form 56-1) and the Annual Report (Form 56-2). These documents, publicly available through the official website of the Securities and Exchange Commission of Thailand (http://www.sec.or.th), provide detailed information on audit fees and various external environmental factors as disclosed in the annual reports.

Table 1 The number of firms listed on Thai Capital Market in year 2020

	Firms
At the beginning of year 2020	556
Add Addition in year 2020	15
Less Withdraw in year 2020	(9)
Add Move from MAI to SET	6
Less Financial sector firms and funds	(92)
Less Incomplete information firms	(7)
Total	**454**

This study uses multiple regression analysis and utilizes a comprehensive modeling approach, categorized into two primary sections: (1) overall analysis and (2) industry-specific analysis. Each section comprises several sub-models designed to provide detailed insights.

Models for Overall Market Analysis Using the PESTEL Framework

Overall PESTEL Analysis Without Industry Control:

$$AF = b_0 + b_1 PESTEL + b_2 Cov\_P + \sum(CVs \text{ except } Is) + e \quad \text{.....(1)}$$

Where:

CVs = Control variables

Is = Industry control variables

Overall PESTEL Analysis With Industry Control:

$$AF = b_0 + b_1 PESTEL + b_2 Cov\_P + \sum(CVs) + e \quad \text{.....(2)}$$

Disaggregated PESTEL Components Without Industry Control:

$$AF = b_0 + b_1 Pov + b_2 Eco + b_3 Soc + b_4 Tec + b_5 Env + b_6 Leg + b_7 Cov\_P + \sum(CVs \text{ except } Is) + e \quad \text{.....(3)}$$

Disaggregated PESTEL Components With Industry Control:

$$AF = b_0 + b_1 Pov + b_2 Eco + b_3 Soc + b_4 Tec + b_5 Env + b_6 Leg + b_7 Cov_P + \sum(CVs) + e \quad \text{.....(4)}$$

Disaggregated PESTEL Components With Positive and Negative Impacts (With Industry Control):

$$AF = b_0 + b_1 Pov_P + b_2 Pov_N + b_3 Eco_P + b_4 Eco_N + b_5 Soc_P + b_6 Soc_N + b_7 Tec_P + b_8 Tec_N + b_9 Env_P + b_{10} Env_N + b_{11} Leg_P + b_{12} Leg_N + b_{13} Cov\_P + \sum(CVs) + e \quad \text{.....(5)}$$

Control Variable

Audit fees (AF) is measured as the natural logarithm of the audit fee amount, following the approach of Picconi and Reynolds (2013) and Arunruangsirilert & Khemmanee (2021). Size (Firm Size) is measured as the natural logarithm of total assets [Ln(TA)] from financial statements (Lifschutz et al., 2010; Tawiah, 2021). Big4 is a dummy variable indicating that the auditing firm is one of the Big 4 firms = 1, otherwise 0 (Kang et al., 2020). Industry type control variables (Is) is represented industry classifications derived from SET, excluding the financial sector. Dummy variables (N-1 coding) are used for the seven industries - AGRO: Agriculture and Food (AGRO), Consumer Products (CONSUMP), Industrial Products (INDUS), Property and Construction (PROPCON), Resources (RESOURC), Services (SERVICE), and Technology (TECH)

Independent Variables

The independent variables are derived from the PESTEL framework, with factors disaggregated into their positive and negative impacts, where applicable. The data collection is performed by counting each related event in both positive and negative matters, scoring 1 point per each. Each total scores are then divided by two, the result is measurement of each variable. Political Factors (Pov) is derived from studies by Liu (2015), Stack (2021), and Zonouzi et al. (2021), encompassing variables like political stability, tax policies, and regulatory controls. Economic Factors (Eco) is drawn from Liu (2015) and Marmol & Feys (2015), addressing GDP growth, inflation, and monetary policies. Social Factors (Soc) includes demographics, cultural attitudes, and social mobility, as identified by Liu (2015), Rahaman et al. (2021), and Stack (2021). Technological Factors (Tec) examines R&D expenditure, technology disruption, and IT infrastructure (Marmol & Feys, 2015). Environmental Factors (Env) encompasses climate change, renewable energy, and sustainability practices (Marmol & Feys, 2015; Kumar et al., 2021). Legal Factors (Leg) focuses on business regulations, consumer protection, and labor laws (Ireland, 2021; Liu, 2015). COVID-19 Positive Impact (Cov_P) captures the positive effects of COVID-19 on firms (1=Positive Impact, otherwise 0).

Findings and Discussion

Descriptive Data Analysis

Descriptive data analysis and correlation are demonstrated in Table 2 as well as variable data distribution graphs are also presented in Figure 2 to Figure 24.

Table 2 Descriptive Data Analysis and Pearson Correlation Coefficient

	AF 1	PESTEL 2	Pov 3	Eco 4	Soc 5	Tec 6	Env 7	Leg 8	Cov_P 9	Pov_P 10	Pov_N 11	Eco-P 12	Eco-N 13	Soc_P 14	Soc_N 15	Tec_P 16	Tec_N 17	Env_P 18	Env_N 19	Leg_P 20	Leg_N 21	Big4 22	Size 23	I1 24	I2 25	I3 26	I4 27	I5 28	I6 29
1	1																												
2	.051	1																											
3	-.005	.533**	1																										
4	.141**	.515**	.135**	1																									
5	-.019	.553**	.228**	.138**	1																								
6	.059	.712**	.247**	.264**	.246**	1																							
7	-.043	.674**	.292**	.150**	.246**	.358**	1																						
8	.046	.647**	.296**	.178**	.307**	.332**	.271**	1																					
9	.012	.203**	.162**	.088	.241**	.135**	.049	.122**	1																				
10	.028	.419**	.816**	.122**	.132**	.196**	.243**	.217**	.115*	1																			
11	-.046	.358**	.632**	.069	.216**	.163**	.179**	.220**	.125**	.068	1																		
12	.116*	.311**	-.032	.777**	.056	.147**	.057	.090	.039	-.001	-.055	1																	
13	.082	.436**	.254**	.633**	.151**	.239**	.169**	.172**	.093*	.196**	.176**	.005	1																
14	.008	.493**	.170**	.173**	.922**	.214**	.184**	.270**	.257**	.077	.190**	.142**	.100*	1															
15	-.068	.302**	.199**	-.037	.475**	.147**	.216**	.175**	.036	.164**	.125**	-.178**	.160**	.098*	1														
16	.050	.694**	.234**	.249**	.235**	.988**	.346**	.326**	.123**	.176**	.168**	.137**	.228**	.207**	.133**	1													
17	.069	.295**	.142**	.155**	.133**	.330**	.164**	.122**	.104*	.173**	.014	.095*	.129**	.095*	.125**	.180**	1												
18	-.047	.676**	.258**	.199**	.259**	.380**	.952**	.274**	.060	.208**	.165**	.113*	.177**	.207**	.196**	.365**	.188**	1											
19	.004	.133**	.166**	-.118*	.011	.008	.352**	.046	.023	.155**	.078	-.160**	.010	-.033	.103*	.014	-.038	.048	1										
20	.022	.613**	.260**	.170**	.291**	.311**	.254**	.967**	.074	.186**	.199**	.103*	.144**	.263**	.150**	.304**	.124**	.267**	.012	1									
21	.101*	.276**	.203**	.070	.129**	.154**	.127**	.355**	.208**	.166**	.128**	-.028	.145**	.086	.136**	.157**	.020	.091	.135**	.106*	1								
22	.208**	.104*	.088	.009	-.003	.100*	.042	.143**	.073	.090	.031	-.035	.058	.000	-.008	.090	.088	.035	.030	.133**	.072	1							
23	.428**	.198**	.075	.199**	-.025	.210**	.115*	.101*	.080	.099*	-.003	.131**	.155**	.019	-.108*	.195**	.144**	.095*	.085	.083	.092	.371**	1						
24	-.003	.180**	.363**	-.077	.024	.090	.187**	.134**	.027	.429**	.051	-.269**	.209**	-.070	.221**	0.069	.149**	.134**	.198**	.087	.207**	.196**	.002	1					
25	-.19**	.379**	.340**	.008	.281**	.268**	.214**	.329**	.131**	.223**	.288**	-.044	.067	.244**	.168**	.253**	.161**	.244**	-.047	.317**	.122**	.028	-.073	.360**	1				
26	-.21**	.323**	.200**	.040	.231**	.267**	.259**	.180**	.118*	.157**	.135**	-.072	.152**	.164**	.221**	.229**	.304**	.292**	-.049	.173**	.066	.005	-.100*	.180**	.270**	1			
27	.005	.277**	.069	.255**	.033	.239**	.214**	.135**	-.098*	.197**	-.145**	.259**	.086	.047	-.021	.214**	.219**	.275**	-.140**	.159**	-.056	.029	.176**	.159**	.250**	.062	1		
28	.006	.316**	.194**	.156**	.062	.308**	.251**	.142**	.096*	.307**	-.077	.109*	.115*	.036	.077	.297**	.147**	.268**	-.002	.148**	.011	.138**	.244**	.300**	.388**	.209**	.189**	1	
29	-.002	.227**	.122**	.050	.299**	.092*	.087	.233**	.047	.039	.158**	-.024	.109*	.273**	.149**	.096*	.000	.144**	-.157**	.240**	.029	.035	-.020	.080	.176**	-.024	-.049	.112*	1
N	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454
Min	13.46	.046	.000	.000	.000	.000	.039	.039	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.077	.000	.000	16.76	.000	.000	.000	.000	.000	.000
Max	19.46	.380	.333	.458	.321	.500	.500	.385	1.00	.500	.333	.667	.500	.643	.214	.889	.111	.923	.307	.692	.231	1.00	28.56	1.00	1.00	1.00	1.00	1.00	1.00
Mean	14.98	.186	.103	.163	.147	.242	.255	.206	.115	.138	.068	.202	.123	.247	.048	.474	.010	.463	.047	.381	.031	.674	22.66	.200	.156	.260	.275	.185	.341
S.D.	.902	.052	.057	.085	.070	.102	.103	.085	.319	.089	.066	.131	.106	.124	.055	.196	.032	.192	.063	.160	.044	.469	1.61	.401	.364	.439	.447	.389	.475
Skewness	1.43	.525	.762	.670	.315	.142	.045	.214	2.429	1.09	.757	.885	.767	.449	.807	.055	2.87	.057	1.56	.172	1.12	-.745	.570	1.50	1.90	1.10	1.01	1.63	.671
Kurtosis	3.34	.908	.785	.163	-.527	-.161	-.735	-.764	3.92	1.46	.240	.659	.211	-.444	-.239	-.232	6.25	-.709	2.66	-.787	..673	-1.45	.540	.256	1.61	-.797	-.986	.652	-1.56
Tolerance		.662	.718	.810	.720	.692	.754	.732	.886	.718	.736	.749	.832	.744	.826	.712	.817	.709	.816	.751	.847	.799	.671	.548	.538	.719	.650	.600	.784
VIF		1.51	1.39	1.23	1.39	1.45	1.33	1.37	1.13	1.39	1.36	1.34	1.20	1.35	1.21	1.40	1.22	1.41	1.23	1.33	1.18	1.25	1.49	1.83	1.86	1.39	1.54	1.67	1.28

*, **, *** are significant at 0.1, 0.05, and 0.01, respectively.

Figure 2 PESTEL Distribution

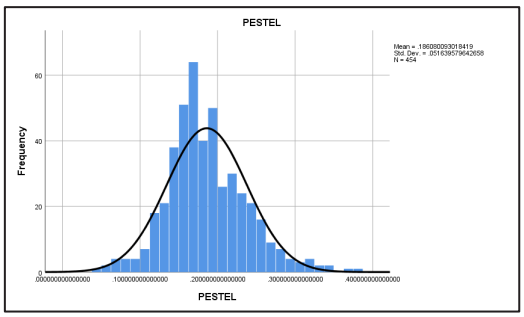


Figure 3 Pov Distribution

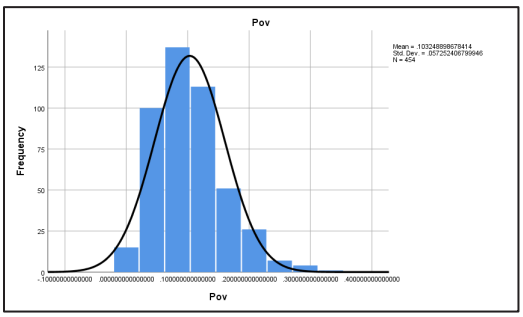


Figure 4 Eco Distribution

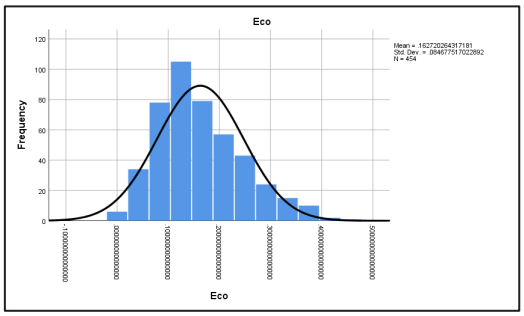


Figure 5 Soc Distribution

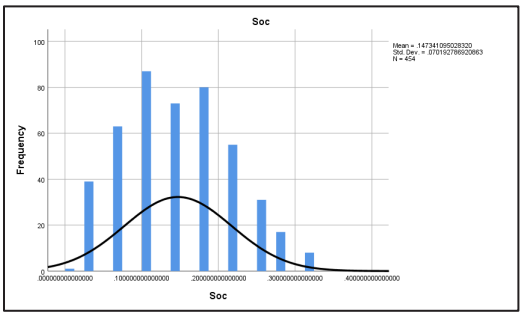


Figure 6 Tec Distribution

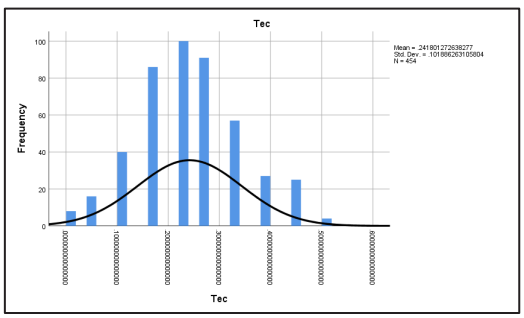


Figure 7 Env Distribution

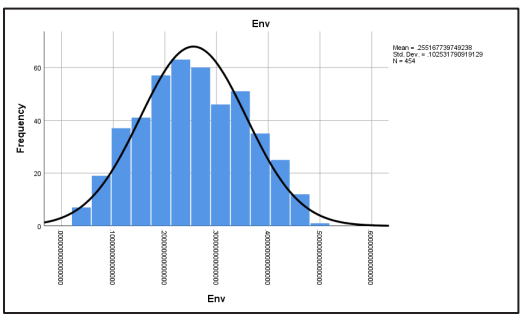


Figure 8 Leg Distribution

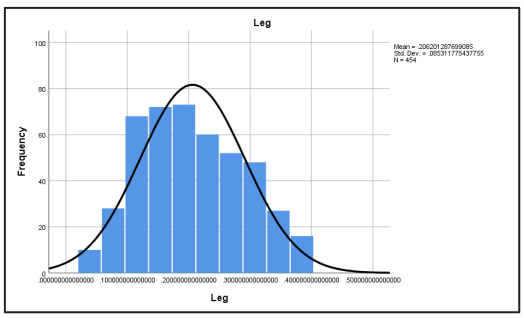


Figure 9 Pov_P Distribution

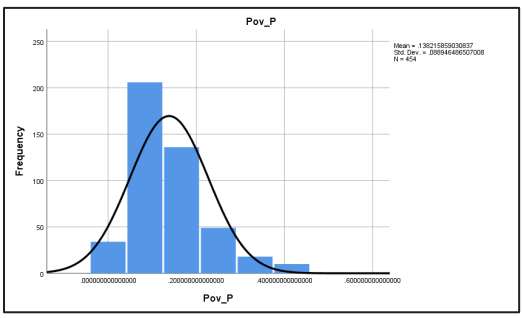


Figure 10 Pov_N Distribution

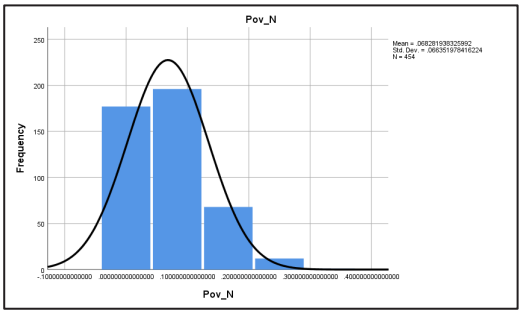


Figure 11 Eco_P Distribution

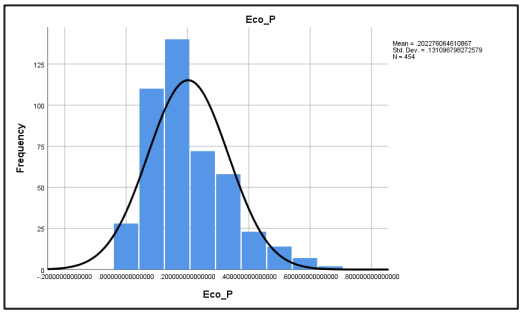


Figure 12 Eco_N Distribution

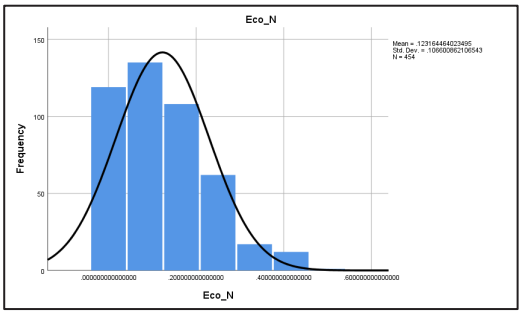


Figure 13 Soc_P

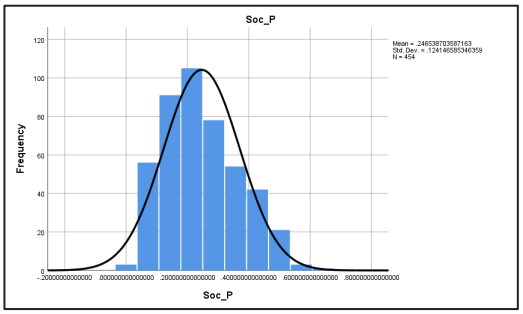


Figure 14 Soc_N Distribution

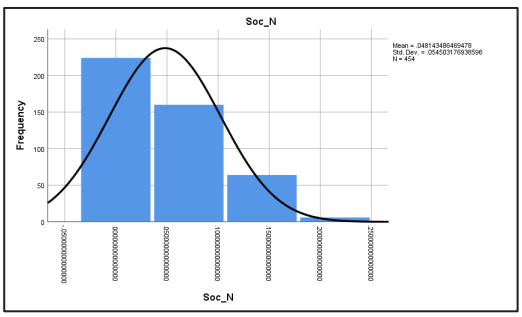


Figure 15 Tec_P Distribution

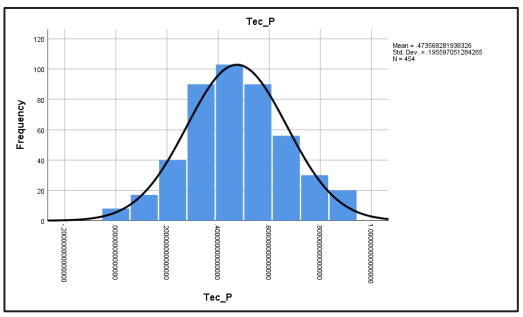


Figure 16 Tec_N Distribution

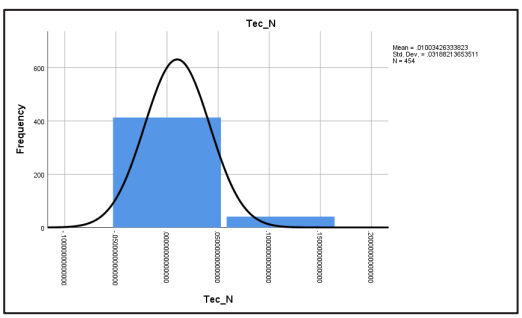


Figure 17 Env_P Distribution

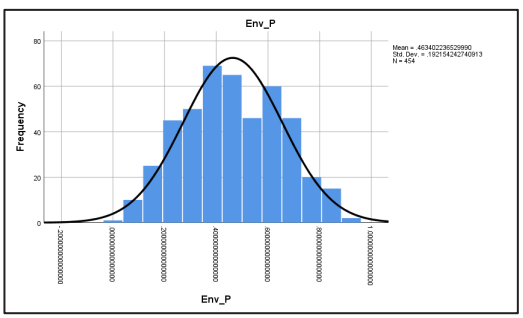


Figure 18 Env_N Distribution

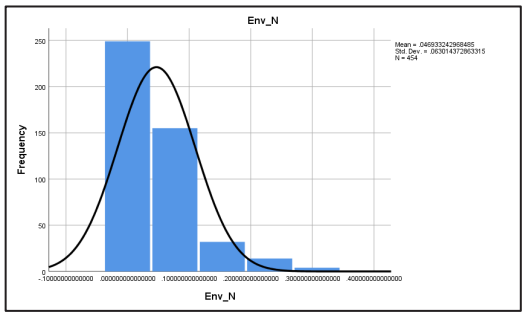


Figure 19 Leg_P Distribution

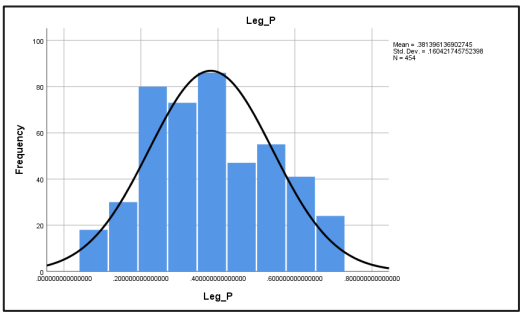


Figure 20 Leg_N Distribution

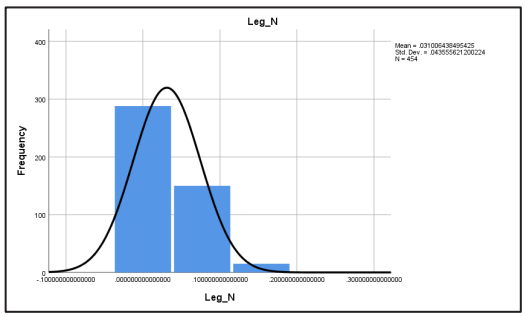


Figure 21 Cov_P

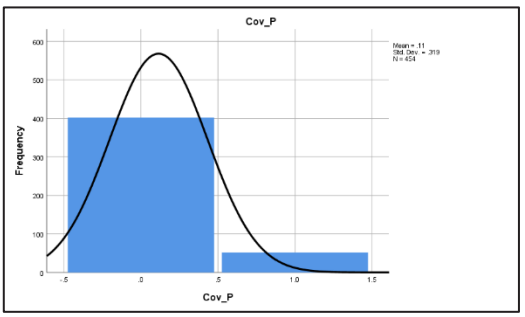


Figure 22 Big4 Distribution

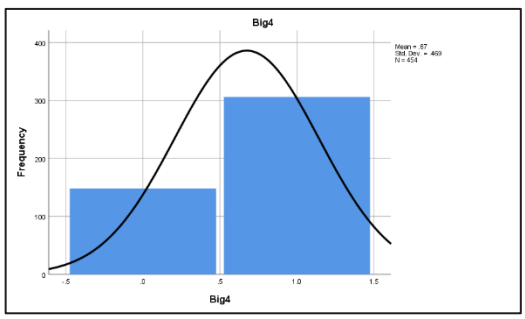


Figure 23 Size Distribution

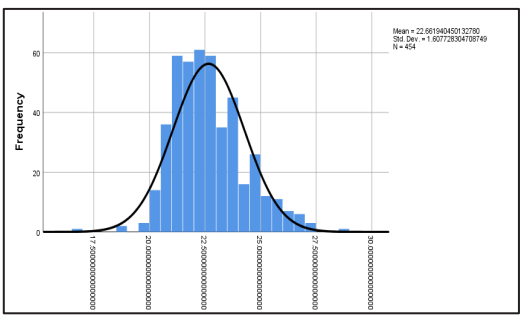


Figure 24 AF Distribution

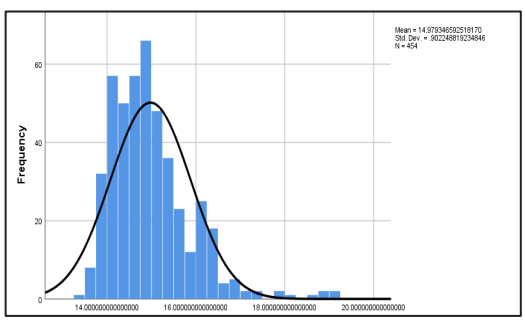


Table 2 provides an overview of the data characteristics, confirming that the sample size comprises 454 companies as predetermined. The dummy variables, which include the independent variable positive impact of COVID-19 (Cov_P) and control variables such as audit firm type (Big4) and industry classification (I1–I6), have a maximum value of 1 and a minimum value of 0, consistent with their expected binary nature. Other variables, structured as continuous scales, also exhibit appropriate numeric outputs. Notably, the independent variables related to PESTEL dimensions are expressed as proportional scores, none of which exceed 1.00.

For the descriptive statistical analysis, the researchers standardized the data, defining a benchmark score of 1.0000 (100%) to represent the comprehensive data in Forms 56-1 and 56-2 across both overall and factor-specific contexts. Scores were categorized into three levels for interpretability: low (0–30%), moderate (31–60%), and high (61–100%). The key findings are as follows:

Overall PESTEL Analysis

The aggregate PESTEL disclosures demonstrate limited variability, with a mean score of 18.61%, categorizing it as low. The maximum score is 37.98%, placing it in the lower range of the moderate category. These results suggest that Thai companies generally place low to moderate emphasis on external factors, such as those encompassed in PESTEL, in their disclosures. Companies tend to prioritize internal factors over external environmental considerations.

Political Factors (Pov)

Political disclosures have the lowest mean score among the six dimensions at 10.32%, indicating a low level of emphasis. The data show limited variability, with a peaked distribution. The highest positive political impact disclosure (Pov_P) is 50%, which falls within the moderate range, suggesting that some companies moderately consider political factors.

Economic Factors (Eco)

The average disclosure for economic factors is 16.27%, categorized as low. The highest disclosure reaches 45.83%, a moderate level. Despite a standard deviation of 0.0847 indicating minimal data dispersion, the maximum positive economic impact disclosure (Eco_P) is 66.67%, considered high, while negative economic impact disclosures (Eco_N) peak at 50%, a moderate level.

Social Factors (Soc)

Social disclosures average 14.73%, within the low range, with a maximum score of 32.14%, categorizing it as moderate. The data distribution is relatively flat but exhibits limited variability, with a standard deviation of 0.0702. Positive social impact disclosures (Soc_P) achieve a maximum of 64.29%, indicating high emphasis, whereas negative disclosures (Soc_N) average only 4.81%, with a maximum of 21.43%, demonstrating a low level of attention.

Technological Factors (Tec)

Technological disclosures have a mean of 24.18%, the second-highest among the six dimensions, though still categorized as low. The highest score is 50%, within the upper-moderate range. Positive technological impacts (Tec_P) exhibit a significant mean of 47.36% and a maximum of 88.89%, reflecting high attention, whereas negative impacts (Tec_N) average only 1%, with a maximum of 11.11%. This trend indicates a strong focus on favorable technological aspects.

Environmental Factors (Env)

Environmental factors have the highest average disclosure at 25.52%, though still within the low category. The standard deviation of 0.1025 indicates relatively higher variability compared to other dimensions. Positive environmental impacts (Env_P) achieve a mean of 46.34%, categorized as moderate, with a maximum of 92.31%, considered high. In contrast, negative environmental impacts (Env_N) are minimal, with a mean of 4.69% and a maximum of 30.77%.

Legal Factors (Leg)

Legal disclosures average 20.62%, in the lower-moderate range, with a maximum of 38.46%. Positive legal impacts (Leg_P) have a mean of 38.14%, classified as moderate, with a maximum of 69.23%, categorized as high. Negative legal disclosures (Leg_N) remain minimal, with an average of 3.10% and a maximum of 23.08%.

Positive Impacts of COVID-19 (Cov_P)

The mean score for positive impacts of COVID-19 is only 11.45%, suggesting that very few companies benefited from the pandemic. Most firms reported no significant positive impacts.

Control Variables

Control variables, such as audit firm type and industry classification, exhibit low data dispersion, reflected in the peaked distributions of related graphs. Similarly, the dependent variable audit fees (AF) follows this pattern.

The results of Pearson's correlation coefficient analysis confirm that none of the independent variables exhibit a coefficient exceeding 0.8 within the same model, thereby ruling out concerns of multicollinearity (Hair et al., 2013). As shown in Table 2, the Tolerance values for both the independent and control variables range from 0.538 to 0.886, while the Variance Inflation Factor (VIF) values are between 1.129 and 1.859. Since all Tolerance values are well above the threshold of 0.1 and all VIF values remain below the acceptable limit of 10, these findings further substantiate the absence of multicollinearity among the independent variables.

Regression Analysis

This study regresses through overall PESTEL and each component of PESTELas well as analyzes each industry which are demonstrated in Table 3 and Table 4, respectively

Table 3 Regression Analysis Results for all Industries

					Beta
	M1	M2	M3	M4	M5
PESTEL	-.033	.095*			
Pov			-.023	-.007	
Eco			.079*	.081*	
Soc			.015	.058	
Tec			-.019	.048	
Env			-.098**	-.068	
Leg			.020	.057	
Cov_P	-.019	-.004	-.027	-.016	-.034
Pov_P					.009
Pov_N					-.012
Eco_P					.074
Eco_N					.018
Soc_P					.058
Soc_N					.011
Tec_P					.030
Tec_N					.074
Env_P					-.037
Env_N					-.074
Leg_P					.039
Leg_N					.072
Big4	.059	.055	.064	.051	.049
Size	.414***	.380***	.406***	.378***	.375***
Industrial	No	Yes	No	Yes	Yes
R2	187.	.242	.202	.254	.264
Adj R2	.180	.225	.185	.228	.228
F-test	25.889	14.13	12.459	9.924	7.383

*, **, *** are significant at 0.1, 0.05, and 0.01, respectively.

Table 4 Regression Analysis Results for each Industry

																				Beta
	AGR M6	AGR M7	AGR M8	CON M9	CON M10	CON M11	IND M12	IND M13	IND M14	PRO M15	PRO M16	PRO M17	RES M18	RES M19	RES M20	SER M21	SER M22	SER M23	TEC M24	TEC M25	TEC M26
PESTEL	.200			-.132			-.050			.098			.433***			-.028			.304*		
Pov		.127			-.045			-.047			-.055			.080			-.145			.094	
Eco		.005			.120			-.059			.026			.466***			.160			.065	
Soc		.001			.187			.185*			-.086			.163			-.127			.119	
Tec		.303*			.111			-.079			-.065			.027			.070			-.089	
Env		-.009			-.212			-.113			.100			-.097			-.020			.178	
Leg		-.131			-.321*			.011			.278***			.076			-.043			.269	
Cov_P	.012	-.004	-.071	.020	-.072	-.095	-.045	-.064	-.113	.010	.231	.012	-.315***	-.287**	-.28**	.078	.127	.098	.284	.176	.142
Pov_P			.025			-.201			-.014			.029			.126			-.076			.294
Pov_N			.220			-.023			-.041			-.101			-.062			-.112			-.007
Eco_P			-.094			.085			.055			.012			.308***			.201**			.209
Eco_N			-.100			.098			-.126			-.101			.376***			.003			-.243
Soc_P			.229			.162			.194**			-.013			.126			-.122			.143
Soc_N			-.395*			.028			.113			-.102			.100			-.073			.106
Tec_P			.322			.145			-.089			-.104			-.008			.073			-.091
Tec_N			.115			.110			.177*			.062			.098			.002			-.204
Env_P			.071			-.245			-.194*			.137			-.093			-.002			.160
Env_N			-.002			.053			-.162			-.141*			.093			-.015			.265
Leg_P			-.088			-.306			-.165			.305***			.182			-.051			.295
Leg_N			.039			.049			.220*			-.007			-.123			.025			.110
Big4	.171	.195	.200	.333**	.365**	.388*	.115	.103	.082	.087	.114	.053	-.228*	-.156	-.169	-.032	-.021	-.027	.012	-.045	-.065
Size	.067	.017	-.036	.435**	.425**	.385*	.53***	.524***	.452***	.625***	.629***	.695***	.595***	.635***	.659***	.123	.085	.078	.151	.246	.262
R^2	.079	.132	.242	.417	.572	.609	.338	.390	.484	.473	.542	.589	.551	.691	.747	.021	.083	.101	.390	.449	.552
Adj R^2	.02	-.05	-.065	.334	.404	.304	.303	.312	.363	.454	.495	.510	.508	.614	.621	-.014	.005	-.023	.316	.272	.246
F-test	1.023	.725	.79	5.008	3.414	1.999	9.571	4.978	3.997	24.855	11.517	7.382	12.595	8.961	5.915	.609	1.069	.817	5.276	2.538	1.804

*, **, *** are significant at 0.1, 0.05, and 0.01, respectively.

Table 3 presents the results of the PESTEL analysis (Models M1 and M2) in conjunction with the Cov_P measure. Before controlling for industry type, no statistically significant relationship was found between the PESTEL framework and audit fees. However, after including industry type as a control variable, a positive relationship between the overall PESTEL framework and audit fees emerged (Beta = 0.095). Additionally, the control variable representing firm size demonstrated a significant positive relationship with audit fees (Beta = 0.380).

For Model M3, the results indicate that two independent variables—economic factors and environmental factors—are significantly associated with audit fees. Economic factors exhibit a positive relationship with audit fees (Beta = 0.079), suggesting that economic impacts are likely to increase audit fees. Conversely, environmental factors show a negative relationship (Beta = -0.098). The control variable for firm size remains positively associated with audit fees in this model.

In Model M4, economic factors are the sole independent variable significantly associated with audit fees (Beta = 0.081). This result implies that environmental factors lose their statistical significance when additional controls are included. Firm size, as a control variable, continues to demonstrate a positive association with audit fees.

Model M5 did not identify any independent variables with significant positive or negative effects on audit fees at conventional significance levels. However, several variables approached statistical significance at the 0.10 level. Among these, economic factors with positive impacts (Beta = 0.074, t = 1.549), technology factors with negative impacts (Beta = -0.074, t = -1.627), environmental factors with negative impacts, and legal factors with negative impacts (Beta = -0.072, t = -1.614) were noteworthy.

Economic factors with positive impacts suggest that favorable economic conditions for firms are associated with higher audit fees. This finding aligns with prior research indicating that audit fees tend to be higher in developed economies with stronger economic conditions, as observed by Chung and Narasimhan (2002) (as cited in Eierle et al., 2021). Negative impacts of technology factors primarily stem from high research and development expenditures or failed innovation projects, which may increase audit fees. Similarly, legal factors with negative impacts, such as disputes, litigation, or increased tax payments, are linked to higher audit fees. These findings are consistent with the studies of Carson & Fargher, 2007; Eierle et al., 2021).

Agriculture and Food Industry (AGR)

Table 4 summarizes the analysis of the agricultural and food industry using Model M6. The results indicate that independent variables, including the PESTEL framework and Cov_P, exhibit no significant relationship with audit fees. This aligns with the findings in Table 4.4, which also revealed that even control variables, such as firm size, lacked statistical significance. However, the analysis using Model M7, which disaggregates the PESTEL factors, highlights a significant positive relationship between the technological factor and audit fees (Beta = 0.303). This can be attributed to the critical role of technology in the production and operational processes within this industry. Additionally, Model M8, which considers both positive and negative impacts of PESTEL factors, reveals that negative social factors are significantly negatively associated with audit fees (Beta = -0.395). These factors often involve investment attitudes that led firms to delay or cancel projects in 2020, reducing audit fees. Conversely, technological factors maintain a positive relationship with audit fees (Beta = 0.322), reflecting the heightened complexity of audit procedures in a technology-dependent industry.

Consumer Goods Industry (CON)

Using Model M9, the analysis of the consumer goods industry indicates no significant relationship between aggregate PESTEL variables, Cov_P, and audit fees. However, control variables such as audit firm type (Big4) and firm size show a positive association with audit fees. Model M10 disaggregates the PESTEL factors and identifies a negative relationship between legal factors and audit fees (Beta = -0.321). Regulatory benefits, such as tax exemptions and import privileges, may reduce audit volumes, thus lowering audit fees. Model M11 reveals that positive legal factors, while not statistically significant, exhibit a negative relationship with audit fees.

Industrial Goods Industry (IND)

In the industrial goods industry, Model M12 shows that aggregate PESTEL factors and Cov_P do not correlate with audit fees, while firm size positively influences audit fees. When disaggregating PESTEL factors in Model M13, social factors are positively associated with audit fees (Beta = 0.185), possibly reflecting lifestyle trends, investment attitudes, and demographic shifts that increase audit complexity. Positive social factors are further confirmed in Model M14 (Beta = 0.194). Additionally, technological factors with negative impacts (Beta = 0.177), environmental factors with positive impacts (Beta = -0.194), and legal factors with negative impacts (Beta = 0.220) all demonstrate various relationships with audit fees, underscoring the nuanced influences of these factors.

Real Estate and Construction Industry (PRO)

The real estate and construction industry analysis using Model M15 reveals no significant relationships between aggregate PESTEL factors and audit fees, except for a positive association with firm size. Disaggregating PESTEL factors in Model M16 indicates a positive relationship between legal factors and audit fees (Beta = 0.278). Model M17 further demonstrates that negative environmental factors negatively affect audit fees (Beta = -0.141), whereas positive environmental and legal factors maintain positive correlations with audit fees.

Resources Industry (RES)

In the resources industry, Model M18 indicates a positive association between PESTEL factors and audit fees (Beta = 0.433), while the positive impacts of COVID-19 negatively influence audit fees (Beta = -0.315). Control variables such as Big4 audit firms exhibit a negative relationship with audit fees (Beta = -0.228), whereas firm size remains positively correlated (Beta = 0.595). Model M19 highlights economic factors as a significant positive driver of audit fees (Beta = 0.466). Model M20 reinforces these findings by showing that both positive (Beta = 0.308) and negative (Beta = 0.376) economic impacts are positively associated with audit fees.

Services Industry (SER)

The services industry analysis using Model M21 identifies no significant relationships between aggregate PESTEL variables, Cov_P, or control variables with audit fees. However, Model M22 identifies a positive relationship between economic factors and audit fees. Model M23 further emphasizes the role of positive economic impacts (Beta = 0.201) in driving audit fees, while other variables remain insignificant.

Technology Industry (TEC)

The technology industry exhibits a positive relationship between aggregate PESTEL factors and audit fees (Beta = 0.304) in Model M24. Model M25 highlights the significant influence of legal factors on audit fees. Finally, Model M26 confirms the positive relationship between positive legal impacts and audit fees (Beta = 0.295), underscoring the regulatory environment's critical role in shaping audit practices.

The findings from the multiple linear regression analysis, as summarized above, provide a comprehensive understanding of the relationship between external environmental factors, evaluated through the PESTEL Analysis framework encompassing six dimensions, and audit fees. This relationship has been examined both at an aggregate market level and across individual industries. Table 5 presents the detailed results of this analysis.

Table 5 Hypotheses Test Results

Hypotheses	Results
H1: Political factors are significantly associated with audit fees.	Reject
H2: Economic factors are significantly associated with audit fees.	Accept
H3: Social factors are significantly associated with audit fees.	Accept
H4: Technological factors are significantly associated with audit fees.	Accept
H5: Environmental factors are significantly associated with audit fees.	Accept
H6: Legal factors are significantly associated with audit fees.	Accept

The analysis, encompassing both the overall market and individual industries, revealed that political factors (Pov) are the only variables that do not significantly impact audit fees, either at the aggregate level or within any specific industry. In contrast, other factors exert a significant influence on audit fees, varying across different industries.

When the results across all industries were aggregated, legal factors (Leg) emerged as the most influential determinant, followed by economic factors (Eco). Social factors (Soc), technological factors (Tec), and the positive impact of the COVID-19 situation (Cov_P) were tied as the third most significant influences.

These findings align with the research of Eierle et al. (2021), which suggested that legal considerations are often prioritized when determining audit fees. Additionally, technological factors have gained prominence as a critical consideration in recent years. This consistency with prior research underscores the evolving importance of both legal and technological influences in shaping audit fees structures across industries.

Conclusion

This study investigates the relationship between external environment by using PESTEL factors in Thailand and audit fees (AF) for companies listed on the Stock Exchange of Thailand (SET) in 2020. The research employs secondary data, with a sample of 454 listed companies. The independent variables include 20 factors within different analytical frameworks, with the overarching PESTEL framework serving as the primary variable. PESTEL is decomposed into six dimensions: political (Pov), economic (Eco), social (Soc), technological (Tec), environmental (Env), and legal (Leg) factors. Each dimension is further classified into positive and negative impacts on companies for more detailed analysis. The dependent variable is audit fees, while the control variables include company size (Size), auditor type (Big4), and industry type (I1–I6).

The data was calculated by assigning proportional scores to the positive and negative impacts for each PESTEL dimension. These scores were averaged within each dimension, and then across all six dimensions, to compute an overall PESTEL score. A multiple linear regression analysis was conducted using various models to explore these relationships.

The findings indicate that the inclusion of industry type as a control variable is critical in the analysis of the relationship between PESTEL factors and audit fees. Specifically, when industry type was controlled, the overall PESTEL framework showed a significant relationship with audit fees, whereas this relationship was not significant without controlling for industry type. Additionally, the results became more detailed and robust. Among the six dimensions, the economic factor (Eco) demonstrated the strongest association with audit fees, with both positive and negative economic impacts positively influencing audit fees. In contrast, a more granular analysis revealed that negative technological impacts (Tec_N) had a negative relationship with audit fees, while negative legal impacts (Leg_N) had a positive relationship.

Further analysis across industries (excluding the financial sector) demonstrated varying relationships between PESTEL components and audit fees, depending on the industry. Generally, the legal factor (Leg) had the strongest influence, followed by the economic factor (Eco), and then social (Soc), technological (Tec), and positive COVID-19 impacts (Cov_P). These findings align with prior research that emphasizes the significance of legal factors and highlights growing interest in technology's influence on audit fees. However, unlike cross-country studies, this research found no significant relationship between environmental factors (Env) and audit fees excepting for only an Industrial sector, possibly reflecting the unique context of Thailand.

The study also found that political factors (Pov), whether positive (Pov_P) or negative (Pov_N), exhibited the lowest scores among all six dimensions and showed no significant association with audit fees, either overall or within any specific industry. This suggests that companies in the SET and audit firms may perceive political factors as less relevant to audit fees determination.

This research underscores the significant relationship between external environmental factors analyzed through PESTEL and audit fees, with variations observed across industries. While political factors appear to have limited influence, they should not be entirely disregarded. Practitioners and audit firms can use these findings to refine audit fees determination by integrating insights from PESTEL analysis. Recognizing these external risks can ensure that audit fees adequately reflect the complexities and risks inherent in the auditing process.

Limitations and Recommendations

This study relied exclusively on secondary data obtained from the annual registration statements (Form 56-1) and annual reports (Form 56-2) disclosed on the website of the Securities and Exchange Commission of Thailand. As such, the data were limited to the information voluntarily disclosed by companies, potentially omitting other relevant environmental factors that the companies chose not to report. These undisclosed factors might be significant for analysis or correlated with audit fees. Additionally, no surveys or interviews were conducted with companies to supplement the data. These limitations may have caused the PESTEL-weighted scores used in the study to be incomplete or deviate from reality.

Furthermore, the critical components of each factor in the PESTEL framework were derived from a synthesis of related research. This approach might have overlooked other important aspects of each factor. The scoring process used to calculate the weighted impacts could also introduce bias, particularly in determining whether a factor's impact on a company was positive or negative. For example, while rubber manufacturers faced significant revenue losses during the COVID-19 pandemic, some experienced increased revenue from the production of medical gloves. In such a case, assigning a positive score (e.g., Cov_P = 1) might not fully reflect the nuanced impact.

This research focused solely on companies listed on the Stock Exchange of Thailand (SET) in 2020. Expanding the dataset to cover multiple years, including pre- and post-COVID-19 periods, or incorporating data from other markets, such as the Market for Alternative Investment (MAI), could provide broader insights. Such comparisons might reveal interesting trends or differences across periods and markets.

Finally, the identification of key components within each PESTEL factor was based on prior research. If additional components, internal data, or company interviews were included, the findings and conclusions could potentially differ. Future studies incorporating these elements might uncover new insights or yield different results.

References

Aguilar, F.J. (1967). Scanning the Business Environment. MacMillan Co., New York.

Arunruangsirilert, T. & Khemmanee, V. (2021). Factors Affecting Audit Fees During the Use of a New Auditor's Report in Thailand. *Journal of Federation of Accounting Professions*, Vol. 7, 34-47.

Aisen, A. & Veiga, F.J. (2013). How does political instability affect economic growth? *European Journal of Political Economy, 29*, 151-167.

Bush, T. (Producer). (2016). PESTLE Analysis: Environmental Factors Affecting Business. Retrieved from https://pestleanalysis.com/environmental-factors-affecting-business/.

Carson, E., & Fargher, N. (2007). Note on audit fee premiums to client size and industry specialization. *Accounting & Finance, 47*(3), 423-446. doi:10.1111/j.1467-629X.2007.00213.x.

Eierle, B., Hartlieb, S., Hay, D., Niemi, L., & Ojala, H. (2021). External Factors and the Pricing of Audit Services: A Systematic Review of the Archival Literature using a PESTLE Analysis. *A Journal of Practice & Theory, Forthcoming*. doi:https://doi.org/10.2308/AJPT-2019-510.

Guo, J., Zhou, S., Chen, J., & Chend, Q. (2021). How information technology capability and knowledge integration capability interact to affect business model design:A polynomial regression with response surface analysis. *Technological Forecasting and Social Change, Volume 170* (September 2021). doi:https://doi.org/10.1016/j.techfore.2021.120935.

Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E. (2013). Multivariate Data Analysis. Pearson Education Limited.

Hillman, J. A., & Keim, D. G. (2005). *The Attractiveness of Political Markets: Implications for Firm Strategy*: Academy of Management Review.

Ireland, R.D., Hoskisson, R.E., & Hitt, M.A. (2009). *The Management of Strategy: Concepts and Cases* (8th Ed.). United States: South-Western Cengage Learning.

Ireland, S. (2021). How Legal Factors Affect Businesses. Retrieved from https://ceoworld.biz/2021/09/21/how-legal-factors-affect-businesses/.

Kang, M., Lee, J.W., Ha, M., & Cho, M.K. (2020). Impact of IFRS adoption on audit pricing: evidence from audit hours and unit audit price in the Korean audit market. *Accounting & Finance, 61*(2), 3517-3564. doi:https://doi.org/10.1111/acfi.12711.

Kumar, S., Sureka, R., Lim, W. M., Mangla, S. K., & Goyal, N. (2021). What do we know about business strategy and environmental research? Insights from Business Strategy and the Environment. *Business Strategy and the Environment, 30*(8), 3454-3469. doi:doi/10.1002/bse.2813.

Lifschutz, S., Jacobi, A., & Feldshtein, S. (2010). *Corporate Governance Characteristics and External Audit Fees: A Study of Large Public Companies in Israel. International Journal of Business and Management, 5*, 109-116.

Liu, C.J. (2015). *Strategic Environmental Analysis-Selected Tools.* (Master's Program). JOHANNES KEPLER UNIVERSITAT LINZ, Retrieved from https://epub.jku.at/obvulihs/download/pdf/417143?originalFilename=true.

Marmol, T.D., & Feys, B. (2015). *PESTEL ANALYSIS Understand and plan for your business environment.*

Picconi, M., & Reynolds, J. K. (2013). Audit Fee Theory and Estimation: A Consideration of the Logarithmic Audit Fee Model.

Rahaman, M. S., Rahman, M. M., Ali Reza, S. M., Reza, M. N., & Chowdhury, M. S. (2021). Thank you, COVID-19: Positive social psychology towards the new normal. *J Public Aff*, e2766. doi:10.1002/pa.2766.

Ross, S. (2021). The 3 Major Economic Components Necessary for Stagflation to Occur. Retrieved from https://www.investopedia.com/ask/answers/040615/what-are-three-major-economic-components-necessary-stagflation-occur.asp.

Simunic, D. A. (1980). The Pricing of Audit Services: Theory and Evidence. *Journal of Accounting Research, 18*, 161-190. doi:https://doi.org/10.2307/2490397.

Stack, S. (2021). Contributing factors to suicide: Political, social, cultural and economic. *Preventive Medicine, 152*(November 2021). doi:https://doi.org/10.1016/j.ypmed.2021.106498.

Tawiah, V. K. (2021). Does the impact of IFRS on audit fees differ between early and late adopters? International Journal of Accounting & Information Management,, 30(1 February 2022), 1-21. doi:https://doi.org/10.1108/IJAIM-04-2021-0085.

TFAC. (2023). Thai Standard on Quality Management (TSQM) No.1. Federation of Accounting Professions.

Zonouzi, M. k., Hoseyni, M., & Khoramshahi, M. (2021). Political factors affecting the survival of SMEs case study: An empirical study in Tehran Grand Bazaar. *Asia Pacific Management Review, 26* (1), 47-56. doi:https://doi.org/10.1016/j.apmrv.2020.07.002.