Bahaaeddin Alareeni
Allam Hamdan   *Editors*

Artificial Intelligence and COVID Effect on Accounting

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Artificial Intelligence and COVID Effect on Accounting

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Foreword

I am delighted to write this foreword, not only because Professor Bahaaeddin Alareeni and Professor Allam Hamdan have been a colleague for more than twelve years, but also because I believe deeply in the importance of accounting and financial reporting in protecting the interests of all parties and stakeholders in the company and achieving transparency and accountability.

This book provides a valuable window on the contemporary issues in accounting and reporting, and covers the necessary components from corporate governance, capital structure and firm's performance, accounting and COVID-19 effects to artificial intelligence, and the future of accountancy.

Many researchers from all parts of the world shared their findings in this book. I believe this book will be a good addition to the active research and accounting and finance system development worldwide in this area.

I hope that this book will become a primer for academics, researchers, students, policy and decision makers helping them to understand recent developments in accounting and finance and its relationship with modern technology and its use in times of crisis.

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Contents

Part III   Artificial Intelligence and the Future of Accountancy

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List of Figures

List of Tables

Part I
Introduction Chapter

Chapter 1
The Impact of Artificial Intelligence on Accounting and Auditing in Light of the COVID-19 Pandemic

Bahaaeddin Alareeni and **Allam Hamdan**

Abstract The relationship between Accounting, Audit activities, and Artificial Intelligence (AI) is extensive and continues to grow, especially now, in the time of the COVID-19 pandemic. All activities in these fields have now used online tools amid COVID-19 pandemic and many activities and practices are carried out taking the pandemic safety measures. The COVID-19 pandemic has impacted human behavior in many aspects and governments all over the world try to decrease the impact of it on businesses and economies. Thus, many efforts have been made to impose the COVID-19 safety measures that use modern technologies. This shows us that there is a need for efforts and extensive research to overcome this problem. AI is a technology used to better efficiency, quality, safety, and solve many problems, quicker than the traditional workers. In this paper, we will direct the researchers' attention to the problems that arise in the field of accounting and auditing because of the ongoing pandemic and suggest some topics to researchers to work on them and help to discover the impact of AI on Accounting and Auditing professions amid and post COVID-19 pandemic.

Keywords Artificial intelligence · Covid-19 · Accounting · Audit

1.1 Introduction

The COVID-19 pandemic has caused a big problem to the whole world in many aspects. It has been compared to the Second World War as well as the Great Depression in terms of the way it has impacted human behavior (Mitevska 2021; Hamdan et al. 2021a, b; Adnan et al. 2020). During the last decades, the kinsman witnessed several pandemics, however, the current COVID-19 pandemic imposed a huge impact

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on societies and economies (Ali et al. 2020). Scientists tried to figure out a solution for this pandemic, but still, they did not find a perfect one to overcome this problem. Yet, nobody can predict when this crisis will be ended too. We are living in an uncertain time that has caused vast losses to many sectors everywhere.

Everyone in every sphere of life was not prepared to deal with this event, including accountants and auditors. The IFRS had to come out with statements, amendments, and changes that needed to be implemented in order to have an orderly financial report given out by the companies who were struggling to do so (Alshurafat et al., 2021; Mitevska 2021). Furthermore, many changes were made since the pandemic first started.

Many businesses tried to continue and overcome this problem and work as normally as possible. This led them to resort to employing new tools and new control systems. Some accounting and auditing companies have begun to apply AI in their work, which depends on automation technology, analytics, and perception technology. The four largest accounting and auditing companies in the world cooperated with AI systems providers to be used for accounting and auditing (Rashwan et al. 2020). Despite this, AI use in the fields of accounting and auditing professions is still in the early stages, despite the expectations stated by the Institute of Chartered Accountants in England, that artificial intelligence will make a radical change in the accounting and auditing profession in the near horizon.

And using AI in accounting activities is necessary to change the content and methods used in teaching accounting courses, which are still taught by traditional methods, as it is required to prepare accounting and auditing cadres to work as financial analysts and auditors with expertise in information technology and participants in developing accounting and auditing systems in order to increase the ability to perform complex accounting and auditing work. In this study, we try to summarize and discuss some points that must be addressed by the researchers to study and how AI can help the accounting and auditing professions.

1.2   AI and Accounting and Auditing

Despite the huge and rapid development in modern technology all over the world, the exploitation of AI by accounting and auditing professional practitioners has not been adequately monitored and controlled yet. AI can help businesses to continue and complete their works effectively and efficiently. This is especially during emergency cases and under uncertain circumstances, such as the spread of COVID-19.

To eliminate and decrease the huge losses in all aspects, and due to the accounting and auditing professions being the key pone of business, it is so important to highlight the use of modern techniques such as AI in accounting and auditing professions.

Suggested research to be carried out to study the impact of AI on Accounting and Auditing.

In this section, we raise the following research questions to help the researchers to find out research gaps to be investigated aiming to find intelligent solutions to

overcome the challenges faces accounting and auditing in light of the COVID-19 and any future similar crises:

1. Will AI impact positively Accounting and Auditing profession quality during and post COVID-19 pandemic?
2. Will AI increase the ability to perform complex accounting and auditing activities during and post COVID-19 pandemic?
3. Will AI enhance accounting and auditing efficiency?
4. Will employing AI help in developing accounting and auditing systems, especially as a need to overcome the COVID-19 pandemic consequences?

1.3   Conclusion

Currently, it's early to determine how AI will affect accounting and auditing professions and it can help a lot to overcome during Covid-19 pandemic challenges and drawbacks. This may take more time and big efforts from countries all over the world. And maybe much more employees will need to be more educated about AI techniques and awareness to benefit from the advantages of AI to solve the problems caused by the COVID-19 pandemic. This, of course, may lead in the future to rely on AI much more than these days, though it can be concluded that AI can enhance accounting and auditing professions' productivity and efficiency.

However, many challenges and difficulties still face AI implementation pre and post Covid-19 pandemic. In addition, this short article does not find a solution for that, it just highlights some hints and raises some questions to be tackled in future research by academics and researchers in the fields of AI, Accounting, and Auditing. Therefore, further studies are needed to focus on the suggested ideas in this paper that may help to overcome the COVID-19 pandemic consequences.

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Part II
Accounting and COVID-19 Effects

Chapter 2
Under the COVID Pandemic: Is It the Springtime for Forensic Accounting Field to Blossom?

Noor Aamer Al Shehab

Abstract While the principle of financial fraud remains the same, new methods and means have been developed as a result of the advanced technology. Due to the large financial scandals which have been recorded throughout the history, the need for "Forensic Accounting" has dramatically increased within business sphere. The pandemic of COVID-19 breeds several challenges for both governments and business firms in alleviating corporate scams, corruption, bankruptcy, money laundering, cybercrimes, and the like. The impact of such illegal practices hits the financial reporting and ultimately leads to misleading decisions. In fact, the internal and external auditors play different roles than the forensic accountants do. Seemingly, auditing and forensic accounting function in one area, but each drives its own way. Therefore, it is vital nowadays to assign forensic accountant who is well equipped with adequate knowledge, skills, and experience. Equally, it is essential to introduce forensic accounting education to meet the existed marketplace demands. This chapter is devoted to provide an overview about the concept of forensic accounting and how the entire world has significantly affected by the white-collar crimes especially during the global lockdown. In addition, it will clear the misunderstanding between forensic accounting and auditing. Furthermore, the chapter will explain the most important knowledge and skills a Forensic Accountant should acquire in order to perform successfully despite the fact that there is a lack of offered courses and degrees in Forensic Accounting globally. Finally, there are a number of issues facing the Forensic Accounting field which will be highlighted and discussed to be improved.

Keywords Accounting · Forensic Accounting · Audit · Investigation · Fraud · Corporate Scams · Money Laundry · Corruption · White-Collar Crimes · Cybercrimes · Artificial Intelligence · Bankruptcy · Dark Web · Higher Education · Pandemic · Bahrain

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2.1 Introduction

Frauds and financial crimes are serious global problems. The COVID-19 crisis stimulates the exploitation of vulnerabilities as digitalized financial services are dramatically employed during the lockdowns. Worldwide, the operational and reputational risks significantly evolved and expanded due to the fact that the massive online presence has led to put substantial pressure on cyber resilience capabilities at different-sized enterprises. Firms are not only facing threats from external parties, but also from internal management and/ or employees. In this regard, several financial scandals, corruption and bankruptcy cases were opened during the pandemic especially when enormous layoffs addressed the instant financial desires to stay away from poverty. Individual employee who is under financial burden may be opted to exercise fraud due to divorce, gambling, or other personal issues.

In order to meet stakeholders' expectations, some firms tend to be engaged in inadequate acts such as: asset misappropriation, bonus maximization, revenue overstatement, expenses capitalization, liabilities understatement, tax evasion, and more. Dishonest financial statements create false picture for which investors and other users would make wrongful decisions about the firm. Principally, the manipulation in financial registers is associated to the core accounting cycles which are sales, purchases, payroll, inventory, and reconciliations. Inevitably, the most difficult thing is to restore general public's confidence about the disclosed financial statements that have jeopardized their trust and reliance.

This situation pushes for the immediate need of "Forensic Accountant" who strengthens the credibility of financial statements in various work environments. It is true that most financial institutions are periodically hiring auditors to prepare their annual financial statements, although the forensic accountant has more acute and critical tasks to do. Forensic accountant deals with diversified matters such as divorce, insurance claims, frauds, auditing of publication rights and terrorism via applying some financial preferences (Zadeh and Ramazani 2012).

In order to minimize the likelihood of frauds, forensic accountant creates proper frameworks, settings, and procedures by offering integrated and real-time sources of information. Normally, when theft, fraud, or embezzlement exist within the business, forensic accountant may be appointed. Thus, governments and business enterprises at the present acknowledge that it is better to hire a forensic accountant before any financial crime takes place. By the same token, Chen in 2006 confirmed that forensic accountant could turn the fraud detection process from a "passive tool to an active role."

Fraud commitment is easy when there is no solid accounting information system within the firm. Consequently, countless cases of white-collar crimes have occurred as a result of the poor internal controls and conditions inside the business. As expected, the absence of a rigid accounting structure deteriorates the financial reporting. In response to the widespread of financial dishonors all over the world, the forensic accounting boosts the corporate governance through creating a favorable working environment that leads to improved fraud deterrence (Bhasin 2013). While adhering

to this, the auditor's duty is to examine the transparency and material misstatement of financial statements which are basically given by management. Explicitly, The Sarbanes Oxley Act states that management is responsible for frauds' detection and correction, and it is not the responsibility of auditors. The auditor could appraise the internal control through testing the segregation of duty and formerly offer helpful endorsements.

The COVID pandemic allows for more national and international financial and trade regulations. Governments update and issue their guidelines that are relevant to tax, money laundry, cybersecurity, corporate scams, and other similar topics. Under this background, higher education should concentrate on such subjects to be embedded in undergraduate programs and work in parallel with forensic accounting experts in courts, organizations, and institutions to deliver the new trends and solutions to seize potential and actual financial deceits especially in our time when digitalized transactions are severely running throughout dissimilar online applications.

The volatile chaos of 2020 has carried several shocking frauds. Wirecard which is listed on the top 30 companies in Germany founded guilty for the disappearance of more than $2 billion from its cash assets. After a sequence of forensic investigations, the company appealed that the money has been saved in Philippines' banks. Nevertheless, these banks rejected such claim. Forthwith, Ernst and Young auditors are in trouble for signing off the financial statements without autonomously confirming the actual cash assets during the suspicious period. What is more is that Wirecard Ireland and UAE are criticized for inflating their profits and sales. KPMG's further investigations in 2019 indicated that the company had not made ample information to public which unsympathetically affected the opinions of interested parties.

Another case has been filed against the famous aviation company Airbus which appointed third parties to bribe officials in different countries to purchase their planes, helicopters, and satellites. After spending nearly four years of forensic investigations, the company in 2020 arranged to pay accumulative penalties exceeding $ 3.9 billion to be the largest fine ever in the history's memory of bribery.

Remarkably, PwC composed data from 99 territories around the world to issue the report of global economic crimes and frauds which explicated that the top kinds of frauds in 2020 were: customer fraud by 35%, cybercrime by 34%, asset misappropriation by 31%, and finally bribery and corruption by 30%. It also stated that within the financial sector, customer fraud is the top distress while governments are tremendously under the cybercrime attacks. The report advises firms to sense fraud symptoms at earlier stages so financial harms can attain quicker recovery (EastNets 2021).

Likewise, the Federal Trade Commission in the USA received more than 200,000 complaints relevant to fraud, identity theft, and spam calls costing almost $ 145 million for the duration of the first nine months of 2020 (*The New York Times* 2020).

This chapter includes seven sections. First, it presents the concept of forensic accounting in literature, its benefits, and the theories with reference to frauds and fraud detections. Secondly, it focuses on the role of forensic accountant for which business firms and other legal entities can truly benefit from him/her. Beside this,

it distinguishes the different roles of auditor and forensic accountant where there is a common confusion between their tasks. Thirdly, it provides an overview of how artificial intelligence can significantly contribute in embracing the frameworks and methods in detecting and discouraging frauds. Moreover, the fourth section discusses the knowledge, skills, and training a forensic accountant should acquire. Fifthly, it shed the lights upon the need of higher education to go hand in hand with accounting practitioners to bridge the gap between accounting education and marketplace desires. The sixth topic indicates several challenges that are facing the educational and occupational sides of forensic accounting field which can be remedied by some convenient recommendations in the last seventh section.

2.2 Literature Review

2.2.1 Understanding the Forensic Accounting Concept

To begin, it is vital to recognize that White-Collar crimes differ from the Blue-Collar crimes in terms of their characteristics and motives. Criminals of the first category are educated, sophisticated, and competent enough to get a job with unwatched access to financial transactions and money sources which drive them for frauds, bankruptcies, corruption, money laundry, and cyberattacks. On the other hand, criminals of the second category have more tendencies to use their physical force during theft, burglary, assault, and vandalism.

The word "Forensic" means appropriate to be used in a courtroom. Forensic accounting goes beyond numbers and reflects the business reality. It gears toward the flow and outflow of money and who is liable. Williams in 2002 defined it as a professional practice that produces valuable analysis and judgment by linking legal and economic viewpoints through certain structures, disciplines, and practices. To put it another way, it is an investigative type of accounting used to conclude if an individual or an organization has involved in any kind of illegal financial actions (Okoye and Gbegi 2013). Forensic accounting as described by the Association of Institute of Certified Public Accountants (AICPA's 2018) is the "application of distinctive skills in accounting, auditing, finance, quantitative methods, law and research." It also demands extraordinary skills to gather, analyze, and consider the available financial indications and evidence to exhibit and communicate findings.

To demonstrate, forensic accounting field covers the accounting frauds, forensic auditing, securities frauds, defaulting on debts, money laundry, privacy information, compliance, due diligence, procurement fraud, risk assessment, detection of financial misrepresentation and fraud, tax evasion, bankruptcy, valuation studies, expenses reimbursement, tampering, violation of accounting regulation, and economic damages (Dhar and Sarkar 2010). Furthermore, it concerns with conflict of interest, claims, accidents, financial disputes related to divorce, reconciliation, arbitration, job suicides, and so on.

In reality, there are well-known names in today's business culture. For instance, Enron, WorldCom, Tyco, Xerox, and others have been recognized for their fraud commitments that lead to disastrous losses. What is not surprising is that financial crimes and scandals are appeared in almost each and every nation whether a developed or a developing country. As usual, media pays extensive attention on fraudulent events, corruption and bankruptcies mainly in the reputable organizations.

The unceasing series of financial misconducts that drive for financial collapse in various international companies obliged the necessity for further auditing requirements. Besides, the surrounding circumstances stimulate the need for forensic accounting's profession since this specialization becomes greater over the last span. Frauds cause unknown losses since it not only deals with financial damages but also with non-financial ones in terms of eroding employee's values, ethics, and organizational culture. Hence, it is difficult to be calculated even though losses are often estimated by experts.

In case financial statements are intentionally prepared unfairly, the results and balances could not identify the actual business situation. Coupled with this, the illegal doings of overstatements, understatements, improper accounting treatments would threaten the going concern principle. The reason behind the manipulation in the accounting records is to provide better perceptions toward the firm by enhancing its financial structure and performance. For this, a number of financial firms were involved in fraudulent actions which pushed them to cheat their stakeholders and present false figures. It has been found that most organizations with no audit committee are more prone to financial crimes.

When financial firms have opted to permit forensic accounting practices, it has been initiated that there are several gains comprising of the following:

– Conveys significant improvement in the quality of frauds' detection and prevention (Houck et al. 2006).
– Greatly helps the official authorities in investigations and evidence documentation (Eliezer and Emmanuel 2015).
– Expenditures are more controllable in public and private funds.
– Corporate governance, separation of duties, and internal control increase (Ozkul and Pamukcu 2012).
– Promotes creative accounting practices.
– Evaluates the firm's financial condition and health.
– Ensures right procedures while liquidation, bankruptcy, and other legal matters are going well.

And now, what is Fraud?

Fraud is a purposeful falsification of financial information by one or multiple individuals among top management, existed employees, or third parties in order to gain undue advantage (Dandago 1997). Lately, many fraud detection theories and methods have been recognized. For example, Cressy in 1953 studied "Fraud Triangle Theory" to explore the reasons behind fraud's commitment and found that each fraudulent case should consist of the four elements below:

1. Pressure: It motivates management or employees to fraud when luxurious pleasures, addiction issues, gambling habits, and large amount bills occurred.
2. Justification (Rationalization): The one who is engaged in illegal acts finds some words to defend himself/herself in front of others once he/she gets trapped to justify the misbehavior.
3. Opportunity: Management is fully responsible for any internal gaps within the accounting and controlling system. Of course, strict governance could prevent the birth of frauds and shrink the opportunities of potential banned plans.
4. Personal Capacity: It was added by Wolfe and Hermanson in 2004 explaining that personal traits and abilities could play a core role in frauds' involvement. This extra element changes the shape of fraud triangle into "Fraud Tile" or "Fraud Diamond."

Fraud Triangle is beheld as the most chief contribution to the forensic accounting ground. However, this theory has been widely implemented by auditors to inspect if frauds are committed or not, it has been criticized and considered useless, incomplete, and biased. Dorminey et al. in 2012 believed that the fraud triangle cannot entirely understand the background of frauds or even the characteristics of other white-collar crimes neither by individuals nor by corporations. Based upon their thoughts, both researchers and practitioners in forensic accounting domain should discard the application of fraud triangle and start to cultivate new contexts, disciplines, and models to obtain a deeper thoughtful of frauds and other types of financial crimes.

In the same fashion, Ma in 2006 proposed the "Fraud Tree Theory" via classifying frauds into three divisions: Corruption, asset misappropriation, and frauds. Subsequently, those main divisions have been allocated into 60 forms rendering to fraud elements.

Unlike frauds, errors are unintentional misstatements or omissions within accounting records or practices. To illustrate, Citigroup has lost out its endeavoring to retrieve more than $ 500 million due to a mistakenly wire transfer to several companies. Therefore, it cannot be treated as a fraudulent behavior.

2.3   Can a Forensic Accountant Truly Benefit Your Firm?

Actually, many auditing firms now have established their forensic accounting department to meet the rising demand of other firms which are suffering from financial misconducts. No wonder that FBI has recently multiplied its forensic accountants to handle innumerable white-collar crimes. It is true that forensic accountant is the one who designs, organizes, and directs the financial phases of investigation. In 2015, Oyedokun defined that forensic accounting is a preventive profession where developing profiles of individuals and corporations becomes the main duty that should be performed by forensic accountant in order to go through deep and detailed interviews for the sake of gathering evidence from witnesses. Next, the forensic accountant

should run specific financial analysis and tests to arrive at accurate conclusions about the occurred fraud so the final report can support the judgments of court as well.

In different parts of the world, forensic accountant is also known as criminal accountant, forensic expert, fraud examiner, and forensic accounting investigator. It is worth mentioning that the conventional audit plan is not designed for forensic auditing, and regular external auditors have usually restricted time to inspect year-end balances. Whereas the role of auditor is to detect errors and material misstatement, forensic accountant seeks to detect frauds and other financial crimes (Skalak et al. 2006). Despite the fact that auditors function based upon sampling selection to prepare their audit report, the forensic accountant checks the whole documents under the named problem to interpret and visualize the results to court. Although auditors and forensic accountants acquire different tasks to do, it is confirmed the correlation between the two fields in combating and preventing frauds. It can be said that forensic accounting bridge the gap in audit via adding value to its framework, procedures, and outcomes (Santos et al. 2017).

Numerous firms certify the effectiveness of controls through their internal audit department. As much as internal and external auditors conduct their responsibilities, financial crimes within the firm continue to cultivate. What bring more complications to fraud's detection and prevention is the lack of auditor's independence mainly when there is a high participation of management (Owojori and Asaolu 2009; Elali 2021; Alareeni 2019). An existed study conducted by Madan in 2013 holds that practice of forensic accounting drives for better corporate governance.

In like manner, Al-Sharairi in 2018 capitalized on the role of forensic accounting in detecting tax evasion cases in Jordan. He claimed that external auditors do not implement forensic accounting methods to identify purposive tax evasion. In addition, he stated that there is no specific governmental authority to deal with forensic accounting services in terms of monitoring industrial companies. He settled that forensic accounting scheme is successful and effective in finding out frauds which are related to tax.

Aduwo in 2016 demonstrates that forensic accounting offers substantial contributions to combat against corruption in Nigeria. It has been reported that 80% of overall criminal proceeds belong to the top 20 leading economies of the world. As known that UK has a rigid anti-money laundry system, the organized crimes cost the country a minimum of £37 billion annually (John Cusack 2019). In addition, the official information in Russia shows that there are 96,124 registered economic crimes between January and October 2020 for 302 billion rubles.

Approaching Arab World, Saudi Arabia in 2017 targeted several princes and businessmen who are engaged in corruption activities and assigned the Ritz Carlton in Riyadh to be the detention for them. The government collected from the settlement an approximate of $13 billion in 2018.

Similarly in 2020, the public prosecution in Kuwait received complaints from local banks about a severe proliferation in the financial assets of few social media influencers. Later, Kuwaiti government started forensic investigations where travel ban decisions and immediate seizure of social media influencers' assets were imposed. During the same period, Kuwait has documented the most high-profile cases in

corruption when the Malaysian fund scandal and the case of Bangladeshi Member of Parliament have drastically disclosed in media which draws sizable attention on these matters.

Identically in December 2020, Bahrain wins the appeal in Future Bank case which has committed with other Iranian Banks in money laundry undertakings for around $ 43 million. The court sentenced the five criminals to prison and penalized them 1 million dinars respectively with confiscation command of $ 3 million of funds and property.

It should be remembered that stakeholders, investors, and participants can only make their rational decisions when they attain dependable financial statements. Accordingly, financial firms are expected to produce and release accurate and trustworthy information and not to hide any financial hurdles. Comparatively, governments around the world have no exception. So again, the serious need for forensic accountant in high-profile financial fraudulent crimes is considerably important to conduct the investigations to bring together the financial forensic evidences. Thus, courtrooms, financial, law and insurance firms could utilize forensic accounting to augment the subsequent activities of:

– Computer Forensics: by developing computerized applications for analysis and presentation of financial evidence.
– Litigation Consultancy: by working with advocate and their clients in terms of case preparation, evidence and strategy.
– Matrimonial Disputes: forensic accountant helps in divorce cases for matrimonial assets and liabilities.
– Dispute Settlement: for resolving cases related to contract disputes, construction claims, products liability claims, infringement of trademarks and patent, and so on.
– Insurance Claims Settlement: to assess claims of policyholders to be settled.
– Meditation/Arbitration Service: to resolve matters related to partnership and corporation disputes.
– Professional negligence: could identify professional negligence cases like non-conformation to GAAP or non-compliance to auditing practices or ethical codes of any profession.
– Criminal Investigation: by attending court to testify court hearings as expert witness and give his opinion in fraud and white-collar crimes.
– Fraud Investigation: assisting business investigations where employee involved in fraudulent activities.

Under the background of frauds, forensic accountants inspect where fraud might occur. Moreover, they endorse if clients, sales, and purchases are authentic. Into the bargain, they keep an eye on any upcoming or doubtful events that may raise the managerial motives and opportunities to manipulate. Therefore, it is important to understand the business values, ethics, management styles, strategies, reward compensation, performance reviews, and structure of top management.

While some firms encourage their employees to report any irregular behavior through diversified mechanisms of whistleblowing such as the hotline, it is originated that 82% of those employees who reported frauds were terminated or resigned under duress (Montesdeoca et al. 2019).

2.4   The Rewarding Integration Between Forensic Accounting and Artificial Intelligence

Outstandingly, the advancement of information technology has created a big challenge in identifying potential frauds amid big data. On the contrary, technology and artificial intelligence yield fruitful outcomes to enhance the operations of fraud detection. "Digital Forensic" is the way to find the desired data which can act as factual evidence in the court. The analytics of big data help to highlight red flagging transactions which are beyond the predetermined threshold (Kranacher et al. 2011). It is exhibited that each analytical tool in forensic accounting has its own advantages and disadvantages.

Nowadays, the financial frauds are fought by intelligence. Artificial intelligence is a key technology with prospective to produce real results in detecting financial crimes. Machine learning as well is widely used to predict and analyze the patterns of payments fraud. This sort of technology enhances the business intelligence approach to be more effective in compliance and legal support services. As asserted, machine learning provides the power of speed, maximizing the likelihood to tackle frauds, and quickly react to patterns where humans alone cannot execute (Irons and Lallie 2014). It is important to balance between human touch and technology by creating a convenient hybrid in order to upturn the efficiency of pinpointing financial crimes.

With the purpose of recognizing financial statements' frauds, countless ratios, statistical models, and other professional techniques are implemented such as:

– Benford's Law: A mathematical tool using the Z-test to spot the probable area of frauds through determining any significant variance between two populations.
– Beneish Model: It fully scans the disclosed financial statement through analyzing the ups and downs in amount from period to another.
– Relative Size Factor's Theory (RSF): After employing specific ratio comparison, all uncommon fluctuations should be underlined and investigated.
– Computer Assisted Auditing Tools (CAATs): It is computerized programs that perform redoing tasks such as recalculation of balances, re-testing details of transactions, locating irregular and erratic fluctuations, and providing sampling for audit purposes.
– Ratio Analysis: Abundant ratios are used to predict the associations between numerous accounting records which help the forensic accountant to pinpoint promising symptoms of fraud.

– Data Mining: Large bulks of data are extracted for noticing the patterns, trends, and variations in the accounting system that benefit in the prediction of any significant deviation from the acknowledged norm. Data mining offers various tools to detect fraud such as: classification, regression, clustering, fuzzy logic, genetic algorithms, and others.
– Documentation Management: It is preferable to establish an electronic system which saves and presents all types of evidence in the legal proceedings. Several financial firms acquire "Forensic Technology Lab" which prevents the manipulation in evidence by storing them in a digital format.
– Spot the Unusual: Forensic accountant should look for the financial transactions entered during the holidays or after the normal working hours since it is a golden opportunity to exercise illegal acts.
– Know Your Employee: It is deemed necessary to verify your employees' credentials in terms of their education, previous employments, unresolved lawsuits, criminal records, psychological and physical check.
– Corporate Intelligence: It is essential to implement "Due Diligence Check" on third parties during partnerships, strategic alliances, mergers, acquisitions to ensure the ownership structure, credit worthiness, compliance, awaiting lawsuits, senior management status, and history of fraud.
– Social Network Analysis: It is a visual analysis that provides abundant insights into the network structure by indicating the centrality of a person within the premeditated network and helps to discover the hidden activities of a certain group over a communication medium by highlighting the connection between two nodes. Consequently, the forensic investigator could determine the most and least influential parts of the fraud.

Apparently when forensic investigations are positioned through networks, the difficulty to find the location of evidence among large log files becomes bigger expressly if they are linked to firewalls and web servers. Grispos et al. in 2012 mentioned that cloud investigations have not received extensive responsiveness in research. For this reason, the available methods and guidelines are unsatisfactory to conduct suitable cloud examinations.

The proliferation uses of dark web which is accessible via particular protocols and networks embrace new numerous ways of online crimes. Phishing emails and fake SMS and websites allow criminals to steal sensitive information from individuals and companies. Malware acts can destroy compromised networks, computers, and mobiles in order to damage the recorded data within systems.

Online criminals can also fake virtual profiles and accounts of victims by abusing their identities, addresses, birthdays, and more. Dark web facilitates the money laundry through transferring illicit funds to compound unnamed accounts. Another popular method to conduct financial crime is to purchase goods or even make fake purchases via stolen credit cards. Beside this, dark web is misused by trading weapons, drugs, hacking, crypto services, and so on. It is worth mentioning that in some countries, cryptocurrencies are considered illegal whereas other countries issue specific regulations to monitor the transactions in this regard.

2.5   What Do We Need to Prepare a Forensic Accountant?

It is pertinent that forensic accountant grabs weighty attention amid global financial markets. Because of the changing aspects of business world and information technology, financial crimes and manipulation become more multifaceted than before. Being a prosperous accountant does not necessarily mean being a successful forensic accountant. As forensic accounting is a fresh branch of accounting that requires specialized knowledge and skills, further education and training courses are highly recommended. Likewise, it is indicated that forensic accountant should acquire "special talents" in auditing, finance, accounting, law, compliance, criminology, computer and web forensics, frauds detection and response, business valuation, ethical standards, and more (Gray 2008). It cannot be overlooked that the forensic accountant should have the ability to function under complex environment to reconstruct the purposeful misplaced and damaged accounting records.

By the same token, forensic accountants should be familiar with the documentation management and court procedures in terms of planning, preparing, gathering, assessing, storing, and retrieving documents and evidence so they can assist lawyers to submit their accurate, reliable, and professional verdicts and defenses toward different cases. Okoye and Akamobi in 2009 appointed that advanced oral and written communication skills are significantly important in this field.

It is imperative also to acquire adequate skills in analysis, leadership, investigation, problem solving, critical thinking, and decision-making. Uyar and Gungormus in 2011 accredited some individual traits such as curiosity, teamwork, creativity, quick response to incidents, having skeptical mind, and nonstop learning. Tempone et al. in 2012 have deliberated presentation skills, the ability to plan and being organized, technological proficiency, and problem solving to be the top characteristics a forensic accountant should possess.

Similarly, Enofe et al. in 2013 underlined the significance of human conduct to deal with disputes. Forensic accountant should attain sufficient knowledge in human psychology, social behavior, and body language to detect criminal actions amid investigative interviews, solving disputes, and gathering evidences from witnesses due to the fact that courtrooms are seeking resourceful and dependable forensic accountants (Crumbley and Smith 2009).

An empirical study about the public sector in Malaysia set by Salleh and Ab Aziz in 2014 specified that there are high ratings for five particular traits of the forensic accountant who is required to be analytical, ethical, detail-oriented, confident, and evaluative. The second objective of the study was to examine the most important core skills of forensic accountant. The findings show that investigative ability, auditing skills, strategic thinking, identifying key issues, and lastly understanding the goals of a case have recorded the maximum score. The secondary skills which are also considered essential for forensic accountant are interpreting financial statements, fraud detection, audit evidence, asset tracking, and internal controls' competencies.

Normally, firms relied on forensic accountant in order to maintain the financial well-being of business especially after the appearance of frauds. With advanced and

complicated systems, it becomes harder to find and quantify economic damages. A forensic accountant deploys statistical packages and scientific methods to reach sound decisions. Most frauds now are going through a detailed process in computer systems. The forensic accountant knows which evidence to extract from the system in order to confirm or decline the fraud.

What is more, both independency and objectivity are crucial for forensic accountant (Ojo 2012). To say nothing that foreign forensic accountants are more favored than locals in many countries even though when they have sufficient and professional knowledge and skills in the field. For instance, the Lebanese government allotted external agency to bear forensic auditing of the Central Bank (BDL) for $2,100,000. The bank claimed that hiring Lebanese forensic accountants might increase the biased activities and conclusions (Fakih and El-Mousawi 2021).

Today, forensic accounting profession is dramatically on the rise as the economic crimes and financial scams are increasing as well. Yet, it is not established or organized however countless public and private organizations globally are under stress of different white-collar crimes.

Next section shows that accounting graduates who have no appropriate insights to forensic accounting's concepts are no longer in demand. Hence, what can higher education do instead to produce qualified forensic accounting graduates?

2.6 Forensic Accounting in Higher Education

The accounting education supposed to produce more qualitative graduates to properly fit within the labor market. Bonita et al. in 2016 appreciates students who attain convenient forensic accounting skills and training as this arena will continue to nurture. This would meaningfully increase their hiring aptitudes and opportunities to work in law agencies, audit and consultancy firms. Empirically, hiring potential is improved when a student finalized a forensic accounting course. Thereupon, Carpenter et al. in 2011 mentioned that students who undertook a forensic accounting course acquire more professional skepticism than others who did not. In addition, Lee et al. in 2015 affirmed that participating in forensic accounting subjects yield higher levels of students' creativity.

The first studies about forensic accounting education identified four universities only which offer a separate forensic accounting course as stated by Rezaee et al. in 1996. However, by 2014, Seda and Kramer found a significant escalation to reach 447 colleges and universities inside and outside the USA with 81 dissimilar certificate or degree programs. It is clear that forensic accountant-published research in developed countries are more than the ones in developing countries such as Bahrain, UAE, Nigeria, Iran, Iraq, Turkey, Lebanon, Jordan. That is because countries such as the USA and Canada recognized the vital role of forensic accounting earlier than others and accordingly started for two decades to invest incredibly in its pedagogies whereas this field is still fresh and evolving in other regions.

Data displayed the very low level of consciousness on forensic accounting between undergraduates in Nigeria (Efiong 2012). Furthermore, accountants in Iran possess limited knowledge toward the methods and techniques of forensic accounting based upon the study of Zadeh and Ramazani in 2012.

China, in particular, established exceptional creativities to expand their financial markets to invite foreign investors. Conversely, local financial regulations do not support the investors' rights and interests. Hao in 2010 clarified that the supply of forensic accounting services is not delivered by any dedicated organization. In reality, the Chinese government controls major industries and hence forensic accounting is practiced more through its official bodies. A survey in 2016 discovered that Chinese students believed that forensic accounting education is significantly essential and would originate better opportunities after graduation. They suggested that forensic fieldwork should be combined to auditing textbooks and engagements (Rezaee et al. 2016).

As a result of experiencing catastrophic financial issues around the globe, accounting professionals, practitioners, and educators started to increase their calls for forensic accounting education (Carozza 2002). In this regard, Buckhoff and Schrader in 2000 examined the perceptions of students, practitioners, and employers about the addition of a course in forensic accounting to the curriculum. The findings of their questionnaire concluded that this would extremely benefit everybody. Another study prepared by Ananto in 2015 highlighted the meaningful phase of introducing forensic accounting subjects to undergraduate students in Indonesia. Notably in Iraq, accounting lecturers admitted the solid association between forensic accounting education and the discovery of frauds (Abdullah et al. 2014).

It can be understood the reason behind the slow response of higher education to work on embedding forensic accounting pedagogy to existed accounting curriculum or even by introducing it as a new separated degree. There is a low awareness about the magnitude and impact of fraud by educators (Bonita 2003). At this point, some academicians preferred the first option of merging forensic accounting subjects to existing courses. On the other hand, some chose separate modules due to lack of room of new topics. Indeed, the principal obstacles for bringing forensic accounting on field are curriculum and faculty as acknowledged by Abdullah and Sutan in 2014.

It is agreed that few universities are interested and concerned about forensic accounting arena. Elitas et al. in 2011 went through a study among the Turkish universities to scan the readiness of accounting instructors in providing the proper knowledge in forensic accounting. They believed that universities should deliver seminars, workshops, and training for their faculty prior to host the new program for students.

Nearly most studies on field on forensic accounting underscored that the primary issues facing the supply of forensic accounting education is the internal restrains including the faculty, administration, curriculum structure, and others. It is neither because of a supposed shortage of demands in the marketplace nor by students' interests.

As a matter of fact, that various zones in forensic accounting such as data analytics, cybercrimes, digital forensics, losses valuation, conflict resolution, and proper remedies need an expert in computers or law which a regular accounting lecturer does not own. So as to enjoy a successful forensic accounting program, universities should acquire strong enrollment and interest of students in the field, qualified faculty, and, of course, career opportunities.

Although forensic accountants commonly learn the forensic accounting analysis and disciplines over their jobs, there is a need to provide the right content of forensic accounting pedagogies in order to satisfy the global dynamics of markets. Absolutely, having one forensic accounting course at university is not sufficient to prepare future forensic accounting. Day by day, academicians and students of accounting spot the dynamic changes and improvements in this major even though forensic accounting on professional and educational levels—in Gulf countries for example—is still absent and unclear. Hence, the gap between industrial demand and forensic accounting degrees is getting wider.

It is rarely to find research about forensic accounting's applications in Gulf countries. In 2011, PWC firm estimated that the white-collar crimes including the fraudulent practices in the Middle East would go up. For example, all forensic accounting employments in Bahrain are occupied by foreign universities' graduates as this degree is not available at all. Hidayat and Al-Hadrami in 2014 initiated that the recent scenario in universities of Bahrain is "not remarkable" under the background of forensic accounting.

Bansal in 2019 claimed that the forensic accounting education in Bahrain has not received any suitable coverage. He presented that the awareness of accounting students about forensic accounting is mainly sourced by classroom lectures, workshops, textbooks, and specialized journals. The same study claimed that the demand for forensic accounting education would increase in the foreseeable future and suggested that at least one forensic accounting course should be delivered to students at senior levels to meet the industry's desires.

Excitingly, there is one more study in GCC which describes the UAE experience to combat frauds through education. The report of global economic crime survey of 2014 specified that UAE faces asset misappropriation by 78%, then cybercrime undertakings, procurement frauds, bribery acts, and corruption. Together with this, frauds reached at 31% which is above the expected average of Middle East of 22%. If financial crimes yield adverse impacts on firms' and people's lives, the auditors from Dubai Courts, Dubai Police, and other financial departments are required to study dual forensic accounting subjects at University of Wollongong in Dubai. Universities in UAE pay attention to bring such accredited courses in forensic accounting as a result of the augmented competition and innovative technology among local and international businesses (Bhavani and Anupam 2018).

If future always holds uncertainty, the USA announced that there is a shortage of nearly 190,000 analytical specialists in Big Data which is mainly employed in predictions and interpretations. For this, Rezaee and Wang in 2018 pinpointed the importance of the integration between forensic accounting and big data under the business curriculum in order to improve students' knowledge and practices.

Besides, the market demand for students with business intelligence (BI) skills is sharply developing according to Wixom et al. in 2014. By the same token, the following five years in the Middle East would require 10,000 data solution architects according to Amazon Web Services report of 2019. Under those circumstances, Bahrain and other countries in this region should dedicate significant investments in education and training in novel specializations such as forensic accounting, artificial intelligence, engineering, science, and space.

2.7 Challenges Encounter Forensic Accounting Landscape

While governments applied confinement measures and travel constraints because of the global pandemic in 2020 till now, new means for criminals generated unlawful earnings. They take advantage of COVID-19 outbreak to commit financial frauds, corporate and medical scams, money laundry, cybercrimes, asset misappropriation, fundraising for fake charities, and so on.

Generally, national authorities along with international bodies notify citizens and businesses about such illegal deeds and motivate them to report any suspicious deeds. Countless central banks announced that social engineering attacks through phishing emails and mobile messages are dramatically increasing during the pandemic by multiple spam campaigns which are directly connected to fraudulent websites which seek personal payment information.

Since the last year 2020, numerous bank workplaces were closed due to the global lockdown and turned to offer their services digitally. This perhaps exposes many customers who are less familiar with online banking to face frauds. Some criminals who exploit economic volatility and remote working conditions find different and innovative ways to bypass the financial regulations via abusing the gaps in internal controls in order to launder funds or conducting other economic crime. The "Digital Onboarding" becomes significantly challenging as there is a serious need to observe unusual flow of funds to monitor high-risk transactions and scan potential doubtful endeavors. Under those circumstances, the occurrence of forensic accounting education and profession is important exclusively in the present time where market disruption, massive layoffs, and economic uncertainty create an excellent environment for frauds to blossom.

It is equally imperative to mention that forensic accountants face dilemmas to carry on their normal tasks during the pandemic where courtrooms are closed, and face-to-face interviews and investigations are difficult to be arranged. Moreover, forensic accountant cannot go through all documents when working remotely. Furthermore, the lack of human contact remains a major problem for which forensic accountant becomes unable to sense the body language of witnesses and suspicious individuals through online platforms such as Zoom. Identically, forensic accountant works with a team of attorneys, internal auditors, experts, and others which are no longer together. The pandemic put the forensic accounting occupation on hold since various chores cannot be accomplished such as the tracing of assets.

Overall, forensic accounting service is more expensive than the regular auditing. Lack of effective internal controls and proper segregation of duties allow for more fraudulent doings inside the business firms. The fragile financial regulations and regimes create golden opportunities for criminals to exploit the gaps and perform illegally. In like manner, forensic accountant could find it difficult to tackle oversea criminals' practices. For this, there is a need to coordinate with Interpol and other international bodies to combat fraudsters. It is essential to bear in mind that forensic accountant should be updated about the new methods, trends, and means of white-collar crimes and how can they response quickly and adequately by implementing the latest business analytical systems.

Coupled with the previous concerns, when senior management put employees under pressure of meeting certain targets, the likelihood to interrupt ethics and values by engaging in white-collar crimes might rise. Thus, forensic accounting career requires special knowledge, skills, and experience to go through long, comprehensive, and complicated phases of investigations and inspections since the findings which are given to court are sensitive and should be precise as they intensely allied to the corporate's image, employees' reputations, and business sustainability.

2.8   Concerns Related to Higher Education

The COVID pandemic raised the concerns toward sustainable education, online teaching methods, learning assessments, and outcomes. With no doubt, eLearning offers flexibility in time and place for both instructors and learners. However, at the same time, it is criticized for the lack of human interactions between them. As affirmed by Aguguom et al. in 2020, the ineffective learning process and performance could lead to adverse results on students' imminent professionalism.

By focusing upon the issues related to forensic accounting in higher education, it is noticeable that distance learning needs a unique pedagogical approach to preserve the quality of teaching and learning aftermath. Liberman et al. in 2020 stated that it becomes necessary to perform more formative assessments to examine the students' understanding. Therefore, labs should be properly equipped with software and educational tools which means satisfactory infrastructure. It is remarkable that students in poor and countryside regions cannot afford the Internet which creates difficulty to access different educational platforms.

According to the current situation where the third wave of the virus is striking the world, several educational institutions call for digitizing the accounting education and look for better ways of students' assessments. Introducing an online forensic accounting course or degree for the first time required distinctive efforts to increase the enrollment of students. Beside this, it is essential to emphasize the self-efficacy of the instructors in terms of their capacity to produce the desired performance attainments especially when new topics or degree in forensic accounting subjects are launched. Accounting instructors also should know how long they need for their lecturing timing.

Recent research prepared by Sarea et al. in 2021 found that around 80% of surveyed accounting faculties among Arab World foresee that digitizing accounting courses would be the new prominent trend in universities. Further findings elucidated the significant role of both Microsoft Teams and Zoom software in leading the online teaching in the same region. It is true that familiarity with technology and low technological fears could extremely enhance the educational learning to become more reliable and efficient.

2.9   Conclusion

2.9.1   Conclusion and Recommendations

It can be concluded that this chapter provided an overview about the concept of forensic accounting basically in terms of fraud and cybercrimes. It also underscored the role of artificial intelligence to enhance the detection and prevention of white-collar crimes. Beside this, it highlighted the principal tasks that should be performed by a successful forensic accountant. Moreover, it pinpointed the type of knowledge, skills, and training which are vital to be attained by the forensic accounting. Furthermore, it mentioned the role of higher education to boost the introduction of forensic accounting courses and/or degrees. After that, it showed the risks associated with this domain on professional and educational sides. Finally, it offers recommendations to improve the forensic accounting sphere in order to promote better results for societies.

2.9.2   Recommendations

As the presence of research in forensic accounting landscape is still at its inception stage, it is greatly recommended to bear more studies on scheming and examining new methods and applications in technology which facilitate a rapid detection of fraud signals. Next to this, it is vital to diagnose the contents of forensic accounting's subjects by compiling the most relevant knowledge to the business curriculum. Here again, the research drives for better understanding of what marketplace demands post to the global pandemic and its destructive impacts on economies.

Since the last decade suffered from countless financial crimes, effective employment of resources and fair presentation of financial statements became the top priorities at every firm. There are several ways to prevent or at least minimize the potential of frauds and other financial misconducts inside the business by undertaking the following recommendations:

– Establish internal solid anti-fraud framework to reduce the risk of illegal practices.
– Keep a constant surveillance on the daily transactions and drive for zero tolerance to frauds through effective leadership.
– Document, share, and communicate the code of ethics among stakeholders on periodic basis through official meetings and online posts on the organization's website.
– Apply and encourage the "Whistle Blower" mechanism for reporting prohibited and suspicious doings within the firm.
– Demonstrate corporate governance through ensuring segregation of duties and strengthening effective internal controls.
– Develop the knowledge and skills of your accountants by motivating them to undertake forensic accounting subjects and relevant professional certificates.
– Collaborate and coordinate with forensic accounting practitioners and educators to identify the need in marketplace.
– Embrace the role of artificial intelligence in discovering and preventing financial frauds.
– Update your system and back up necessary information regularly.
– Encourage for audit committee.
– Review your regulations continuously to find any existed gaps.
– Run ad hoc risk assessment whenever needed.
– Apply durable cyber resilience measures and increase data protection activities.
– Learn from other financial firms' mistakes and experiences and inspire them with stories of courage.
– Prepare your crisis management and communication plans.
– Financial firms could call for "Forensic Accountant Association" to organize more events and fruitful discussions regarding this issue.
– Ensure the alignment with the country's financial regulations and report for any probable or existed financial crime at the official authorities.

In the same fashion, higher education is recommended to:

– Adjust accounting curriculum to meet the needs of labor market.
– Conduct more research about forensic accounting through integrating education and industry.
– Deliver forensic accounting workshops, lectures, and seminars to those who are interested in order to increase the awareness about this field and to improve the faculty capabilities to teach the relevant subjects effectively.
– Ascertain the hiring potential for students and the role of forensic accounting at this time to maintain the well-being of economy by shutting down the likelihood of white-collar crimes that could severely damage the civilizations.

To end with, governments could enhance its economic crime measures through:

– Designing a study on economic regime that combats all types of economic crimes.
– Reviewing financial regulations and laws occasionally to detect any gaps which criminals could exploit to bypass their illegal doings.

- Increasing the awareness of public toward the economic crimes and its bad impacts on societies; informing them about the penalties as well.
- Encouraging people to report any doubtful acts under the umbrella of economic crimes and reward them with non-monetary incentives.
- Performing regular risk assessments for all official authorities.
- Updating effective plan for cybersecurity.
- Maintaining effective and latest systems and methods for frauds detection.
- Educating and training the concerned employees who work in auditing, anti-fraud, and compliance occupations.
- Disclosing financial crimes' cases in different media platforms so everybody learns.
- Verifying that governmental, semi-governmental, and private enterprises are functioning in safe environments.
- Responding properly to holistic economic prohibited activities.

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Chapter 3
Co-movement Among COVID-19 Pandemic, Crude Oil, Stock Market of US, and Bitcoin: Empirical Evidence from WCA

Bassem Ghorbali, Kamel Naoui, and Abdelkader Derbali

Abstract   In this paper, we investigate empirically the time–frequency co-movement among the recent COVID-19 epidemic, the financial stock market indices in USA (S&P500), crude oil price (WTI), and cryptocurrency markets (Bitcoin) using both continuous wavelet transform and wavelet-based approach. In this study, we use continuous wavelet transforms (CWT) and wavelet coherence analyses to study the co-movement among recent spread of the COVID-19 epidemic and US financial market, including the stock market return (S&P500 index), the West Texas Intermediate (WTI) crude oil price and cryptocurrency market (Bitcoin) for the period January 17, 2020 to December 10, 2020. Overall, we find that all variables displays a strong volatility concentrated in the first four months of COVID-19 outbreak. In addition, our findings reveal a strong level of co-movement between US COVID-19 confirmed cases and each US financial market index. In contrast to comparative assessment in conditions of reactions to COVID-19 pandemic in US, US COVID-19 confirmed cases have relative higher impact on the co-movement in WTI and Bitcoin.

Keywords COVID-19 pandemic · US financial markets · Crude oil · Bitcoin · Wavelet coherence analysis

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3.1 Introduction

At the beginning of the year 2020, the world has experienced several bad news related to the new epidemic that affects the global economic growth. The novel COVID-19 outbreaks in Wuhan city in the close of 2019. On January 11, 2020, the Chinese authorities declare the first death from COVID-19 reported in Wuhan. After two days, the first case of novel coronavirus outside China conformed by Thailandese authorities. On January 21, the United States declare the first confirmed case in Washington, on January 31, the Trump administration two next days exactly on February 2 Philippines reported the first death from coronavirus. On February 14, France registers the first coronavirus death in Europe. On February 23, Italy saw a major surge in cases grew from fewer than five to more than 150 cases. On February 29, United States announced the first death.

On March 11, the COVID-19 epidemic is announced as a pandemic by the WHO. On March 14, the President of US, Donald Trump, declares a travel embargo on the UK and Ireland, expanding remaining constraints including continental Europe. This bad news triggered a new shock in the stock markets of US and the Asian and European stock markets. For the American stock market, the Dow 30 stock index had lost 1,145 points, or 4.9%, while the S&P 500 index was down 4.5% and the Nasdaq 100 contract was down 4.7%, erasing all the gains of the last two and a half years. European equity markets suffer even more, with the Stoxx 600 benchmark index falling 5.5% to its lowest level since 2013, the FTSE100 of UK falling 5.4% and the German DAX30 down 5.6%. Chinese equities outperform with all major indices losing less than 2.5%. However, the Australian benchmark fell by 7.7% and the Japanese Nikkei 225 index fell a further 4.4%.

This paper analyzes the influence of recent outbreak health crisis (COVID-19) on oil prices (WTI), US stock market (S&P500), and cryptocurrency market (Bitcoin). Numerous investigations have analyzed the link among variables of financial market. Wen et al. (2012) use the copula method to examine the contagion impact among the oil market (WTI) and the US and Chinese financial stock market through the subprime and financial crisis of 2007. The advantage of using the copula method is that this method could give a non-linear dependency size. Therefore, the empirical results prove that there is a contagion phenomenon between the two markets.

Chen and Xin (2015) establish a research work that addresses the dependence between prices on the oil and the financial stock market in China. In this respect, estimates show that the size of dependence increases during and after the crisis period between the two markets for cyclical and non-cyclical sectors, respectively. According to the authors, the increase in dependency size between the two markets after the crisis period could be explained by the contagion phenomenon. Shahzad et al. (2020) apply the AGDCC-GARCH specification to examine the dynamic relationship between Bitcoin and the G7 stock indices on the one hand and between gold and the G7 financial stock market indices on the other hand. They show that gold offers a hedging instrument for the stock indexes of Japan, France, Germany,

United Kingdom, Italy, USA, and the MSCI G7 index while Bitcoin offers a hedging instrument against the investment risk only for the Canadian stock index.

Chan et al. (2019) investigate the impact of Bitcoin on Euro STOXX, Nikkei225, Shanghai A-Share, S&P500, and the TSX Index in terms of portfolio hedging and diversification. Using the PGARCH and CCC-GARCH model. The results show that Bitcoin is an effective hedging instrument for indices for both monthly and daily returns. Similarly, the results show that Bitcoin is a better hedge for the S&P500 index than the Shanghai A-Share index.

Oil prices, Bitcoin, and stock market return are influenced by several factors. Previous studies examine, for example, geopolitical risk (Sharif et al. 2020), economic policy uncertainty (Elali 2021; Matkovskyy et al. 2020; Albulescu et al. 2019), weather condition (Agnello et al. 2020), news (Su et al. 2017; Mun and Brooks 2012), and Terrorism (Chesney et al. 2011; Orbaneja et al. 2018).

The global economy, and specifically the financial market may also respond a Public Health Crisis of International Concern. Since, the WHO has confirmed that H1N1 2009–2010, Ebola epidemic 2014–2016, Zika Virus epidemic 2015, several study have examined the response of financial market to this bad news. Chen et al. (2007) analyze the influence of the SARS epidemic on Taiwan economy. Chen et al. (2007) demonstrate that the tourism industry record a downturn during the first month of the SARS outbreak. As well as, Ichev and Marinc (2018) analyze whether Ebola outbreak 2014–2016 affected stock price in the US. The results show that the information about Ebola outbreak influenced the financial stock market price in USA and the financial markets. Recent papers examine the influence of COVID-19 epidemic in international financial market.

In their study, Al-Awadhi et al. (2020) demonstrate that the daily COVID-19 confirmed cases and total cases of death interacts negatively with stock returns for all companies on the Chinese stock market. Goodel et al. (2020) examine the co-movement of Bitcoin with daily COVID-19 world deaths. They find that level of COVID-19 world deaths cause a growth in Bitcoin prices. Finally, Goodel et al. (2020) study the differentiating, hedging, and reliable heaven assets of Bitcoin during the period of coronavirus outbreak. Also, Sharif et al. (2020) analyze the correlation among the recent propagation of COVID-19, oil price volatility surprise, the financial stock market, the geopolitical risk, and the economic policy ambiguity in the United States. Their empirical findings demonstrate that the COVID-19 outbreak additionally influence the oil price indices, which can be justified by enforced travel constraints. Dutta et al. (2020) conclude that the current propagation of the COVID-19 epidemic drives crude oil markets to a slump. Using the DCC-GARCH, with a view that gold is considered as a safe haven for the crude oil markets amid the spread of COVID-19.

Figure 3.1 exposes the evolution of WTI as reference of crude oil price, the S&P500 as benchmark of US stock market, the Bitcoin as the reference of cryptocurrency market and the US COVID-19 confirmed cases. Figure 3.2 shows that the crude oil (WTI) was down since the COVID-19 confirmed cases have recorded in USA. The crude oil prices registered a free fall over January 2020 to April 2020. The exponential increase of the oil prices can be explaining to both the outbreak of
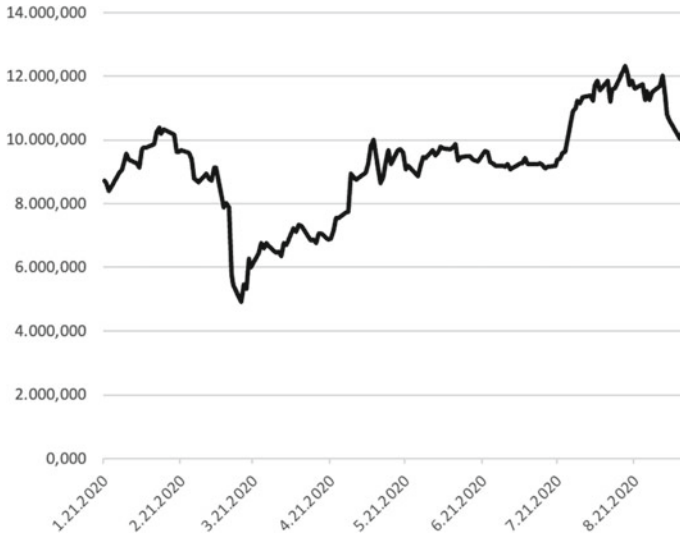
Fig. 3.1 Time series trend of Bitcoin
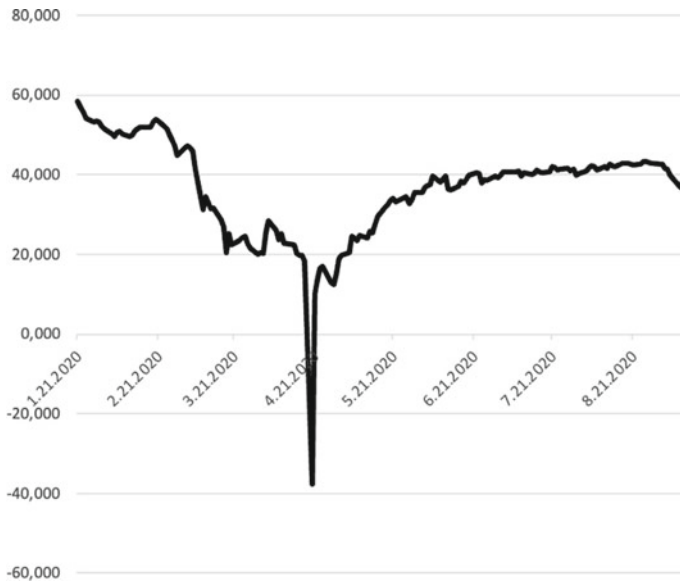
Fig. 3.2 Time series trend of WTI price

Fig. 3.3 Time seriestrend of S&P500 index

COVID-19 and following the unanticipated judgment of Saudi Arabia regulators to rise this production and offer a price discounts to their principal consumers in Europe region, Asia countries, and the US. On April 20, 2020, the price of crude oil plunges into negative territory (Figs. 3.3 and 3.4).

According to Fig. 3.1, the S&P500 index presents a two-phase: a free fall during January 2020 to end of March 2020 then an exponential increasing. As well as, we can observe a two-phase related to the movement of Bitcoin: a downward trend over the January to mid-March 2020 and an uptrend. We also remark that the movement of US COVID-19 confirmed cases is a two-state: an exponential increasing of the confirmed cases number starting until middle of January 2020 to end July 2020 then a quite linear decreasing the financial contagion occurs during the period of COVID-19 crisis.

The conditional correlation increase of financial and nonfinancial firms between G7 and China during the spread of COVID-19 indicates the mission of financial and nonfinancial firms in financial contagion transmission (Akhtaruzzman et al. 2020). Furthermore, Corbet et al. (2020) show that the Chinese stock markets return and the Bitcoin offers a significantly volatility relationship during the COVID-19 crisis. They found that Bitcoin is not a safe haven for the Chinese stock market au cours the COVID-19 pandemic.

Figure 3.5 offers the unconditional connection coefficients between the return of used series (S&P500, WTI, Bitcoin) from May 28, 2019 to January 16, 2020. This period is considered as pre-COVID-19 in USA. The negative correlations are revealed for bitcoin with S&P500 and bitcoin with WTI. Therefore, the correlations are positive for the case of S&P500 with WTI.
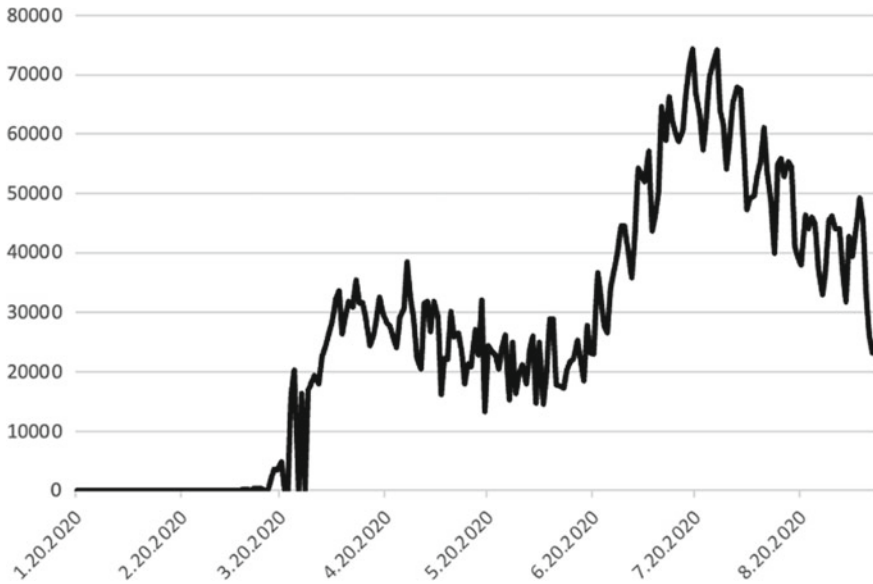
Fig. 3.4 Time series trend of US COVID-19 confirmed cases

Figure 3.6 presents the unconditional correlation coefficients between the return series (S&P500, WTI, Bitcoin) from January 17, 2020 to September 10, 2020, and this period is considered as during-COVID-19 in USA. Figures 3.2–3.6 shows that all correlations are positives during COVID-19 pandemics. The correlation between BTC with S&P500 affiche a higher value of correlation. Comparing the periods both before and during period of spread of COVID-19, we notice significant changes in correlation structure. There is evidence of elevated correlation between S&P500 index and Bitcoin, rising from −0.14 to +0.44 as market circumstances started to decline. Exceptionally sharp improved connection is additionally obvious among WTI and Bitcoin improving dramatically from −0.07 to + 0.14, while the relationship among S&P500 index and WTI decreasing from +0.2 to +0.1.

The US COVID-19 outbreak seems to be the main cause to both the shock in WTI price, S&P500 index, Bitcoin and the change in correlation structure. These anxieties are encouraging our research to analyze the co-movement among the COVID-19 confirmed cases in USA with financial market (WTI price, S&P500 index, Bitcoin) in the USA inside a period occurrence-founded methodology. Then, to reveal this relationship, we use the wavelet approaches. In this context, we accomplish the CWT (continuous wavelet transform) and the WC (wavelet coherence).

In this study, we chose the U.S. financial markets to examine the co-movement between COVID-19 pandemic and financial market for several reasons. First, the U.S. financial markets is the main source in the U.S. economy growth. Second, the daily infected cases of COVID-19 in the U.S. unveiled an exponential increase since mid-January 2020. Third, the US financial markets consider the major causes of a
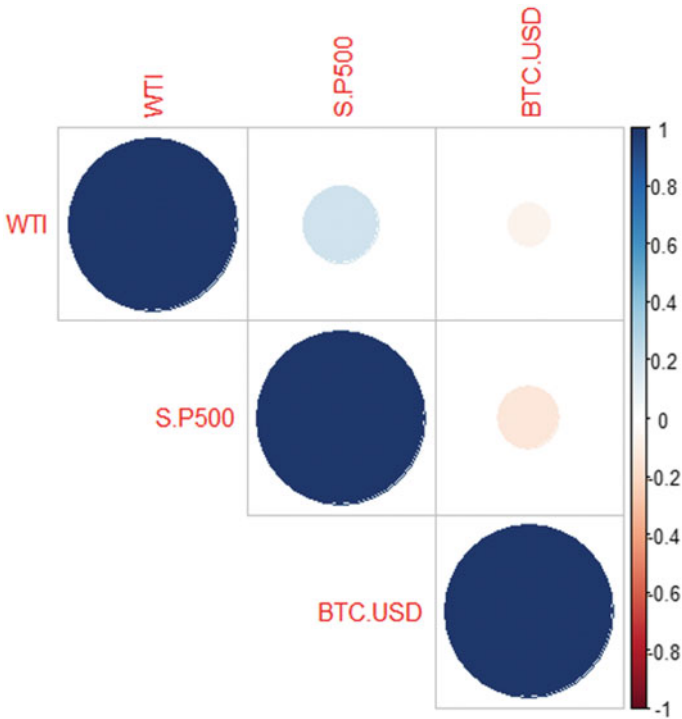
Fig. 3.5 The correlation matrix of WTI price, S&P500 index and Bitcoin pre-COVID-19 (28 May 2019–16 January 2020)

spillover impact to additional financial markets and other regions, as corroborated by Syriopoulos et al. (2015) and Bekaert et al. (2011).

The reminder of our study is structured as follows; Sect. 3.2 presents the data and methodology. Section 3.3 shows and examines the empirical findings. Finally, we conclude in Sect. 3.4.

3.2 Data and Methodology

3.2.1 Data Analysis

For our analysis, we collect the price of S&P500 index as benchmark of U.S. stock market, the WTI oil prices as benchmark of crude oil market, the Bitcoin as benchmark of cryptocurrency market, and the US COVID-19 confirmed cases indicates the infected cases in the US.
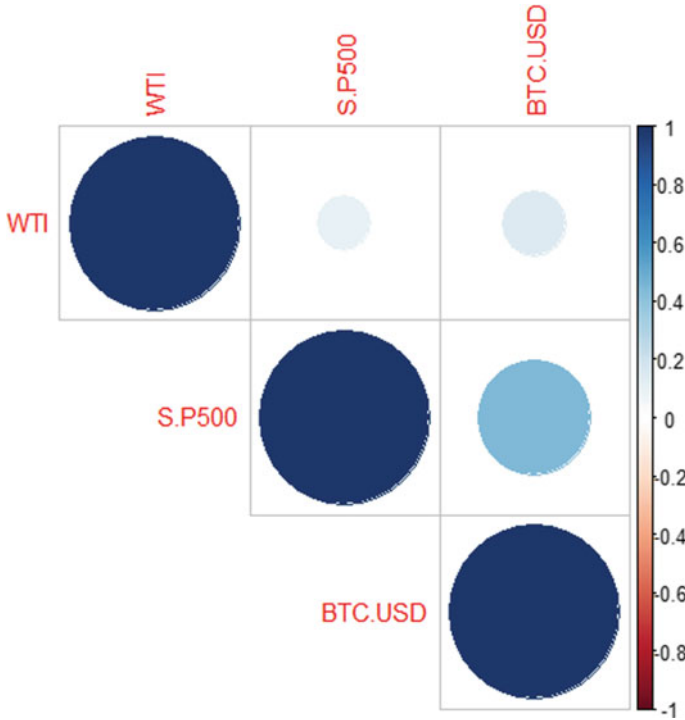
Fig. 3.6 The correlation matrix of WTI price, S&P500 index and Bitcoin during COVID-19 (17 January 2020–10 September 2020)

The data of US confirmed cases are collected from the website of the World Organization Health (WHO). Moreover, the data concern the WTI, S&P500, and Bitcoin are obtained from Thomson Reuters. The data cover the period from January 21, 2020 to September 10, 2020, including 164 observations. We compute the return for the time series (S&P500, WTI, BTC) by finding the difference between two closing consecutives prices as follow:

$$r_{i,t} = (P_{i,t} - P_{i,t-1}) \tag{3.1}$$

where i indicates the S&P500, WTI, Bitcoin.

Finally, we use the three index in US financial market (S&P500, WTI, Bitcoin), help us to find both, the level of co-movement between US COVID-19 confirmed cases with US financial market and construct a comparative assessment in conditions of reactions to the COVID-19 pandemic in US.

Table 3.1 reports the descriptive statistical of COVID-19 confirmed cases in USA and the return series of S&P500, Bitcoin, and WTI. For the return series of financial markets the Table 3.1 shows that Bitcoin has remote higher values for the volatility and mean. In contrast, the crude oil prices WTI registered negative average return

Table 3.1 Summary descriptive statistics

	US COVID-19	WTI	Bitcoin	S&P500
Mean	25,484.600	−0.129	9.908	0.136
Max	9641.000	47.640	1266.115	230.380
Min	0.000	−55.900	−2091.075	−324.890
Std.Deviation	20,358.280	6.015	371.165	71.615
Skewness	0.312	−1.850	−1.227	−0.757
Kurtosis	2.124	70.255	10.773	7.090
Jarque–Bera	7.904**	31,002.350***	454.021***	129.997***

Note ***, **, * indicate the statistical significance at the level 1%, 5% and 10%

and lower values for the volatility. The unconditional volatility, calculated by standard deviation is higher across US COVID-19 confirmed cases. Skewedness coefficients for all return series of financial markets are negative only for the US COVID-19 confirmed cases. For the three return series of financial market, the Table 3.1. displays the excess kurtosis. These findings confirm that the probability distributions of financial market return series are asymmetric and leptokurtic. The coefficients of Jarque–Bera statistics are significate of the level of 1% for the series of financial market and 5% for the US COVID-19 confirmed cases. Normality of the return series and US COVID-19 is strongly rejected.

3.2.2 The Wavelet Continuous Transforms (CWT)

The technique of continuous wavelet coherence transforms $W_x(a, b)$ reports that the projection of a wavelet ψ (.) in both time–frequency spaces.

Wavelet functions are decomposed by location, mother wavelet function and scale, which is defined as follows:

$$\psi_{u, s}(t) = \frac{1}{\sqrt{s}} \psi \left(\frac{t - u}{s} \right), \ \psi(.)\epsilon L^2(\mathbb{R}) \tag{3.2}$$

where $\frac{1}{\sqrt{s}}$ represents the normalieation factor, ensuring that the unit variance of the wavelet $||\psi_{u,s}(t)||^2 = 1$. u denotes the location parameter, offering the precise position of the wavelet, and s denotes the scale dilation parameter, showing how the wavelet is stretched or dilated. Thus, the Morlet wavelet can be expressed as follows:

$$\varphi^M(t) = \frac{1}{\pi^{1/4}} e^{i\omega_0 t} e^{-t^2/2} \tag{3.3}$$

.

where $\frac{1}{\pi^{1/4}}$ ensures unity energy of the wavelet, and ω_0 designates the central frequency of the wavelet. According to Grinsted et al. (2004a, b), Rua and Nunes (2009), and Vacha and Barunik (2012), ω_0 must be equals six. Moreover, following Rua and Nunes (2009), with convolution applied to a discrete sequence and a scaled and translated wavelet, the CWT can be defined as follows:

$$W_s(u, s) = \int_{-\infty}^{\infty} x(t) \frac{1}{\sqrt{s}} \psi\left(\frac{t-u}{s}\right) dt \qquad (3.4)$$

So that, to reconstruct a time series $(t) \, \epsilon L^2(\mathbb{R})$, we must inverse the continuous wavelet, using follow formula.

$$x(t) = \frac{1}{C_\varphi} \int_0^\infty [\int_0^\infty W_x(u, s) \psi_{u,s}(t) du] \frac{ds}{s^2}, > 0 \qquad (3.5)$$

Thus, using Eq. (3.5) the power spectrum analysis can be calculated, also the description of the variance being

$$||x||^2 = \frac{1}{C_\varphi} \int_0^\infty \left[\int_{-\infty}^\infty ||W_x(u, s)||^2 du\right] \frac{ds}{s^2}, s > 0 \qquad (3.6)$$

Following Grinsted et al. (2004a, b), the null hypothesis announced that the time series generating process (provided by an AR(1) stationary process with a certain background power spectrum (Pf)) is statistical significance. Torrence and Compo (1998) compute the white noise and red noise wavelet power spectra based on Monte Carlo simulations and derive that the corresponding distribution for the local wavelet power spectrum under the null hypothesis is as follows:

$$D\left(\frac{W_n^x(s)^2}{\delta_x^2} < p\right) = \frac{1}{2} p_f \chi_u^2 \qquad (3.7)$$

where p_f is the mean spectrum at Fourier frequency f. The wavelet scale s corresponds to the Fourier frequency (s 1/f). The real wavelet has $v = 1$, and the complex wavelet $v = 2$. The variance of the corresponding variable is denoted by x.

3.2.2.1   The Wavelet Coherence (WC)

Based on the developed approach of Torrence and Compo (1998), we can admit that the CWT (cross-wavelet transform) can be found using two-time series, such as $x(t)$ and $y(t)$:

$$W^{XX}(n, s) = W^X(n, s) W^{X^*}(n, s) \qquad (3.8)$$

where $W^X(n, s)$ *and* $W^Y(n, s)$ capture two continuous transforms, respectively, for *x(t)* and *y(t). n* and *s* describe the time index and the time scale, and * represents the complex conjugate. The method of cross-wavelet transform shown the areas in the couple time frequency where the two-time series exposed a high conjoint power. In addition, this approach measured the local covariance generated between two-time series.

The wavelet coherence identify co-movement between two time series $x = \{x_n\}$ and $y = \{y_n\}$ is marked by the time intervals and frequency bands in which the two time series co-vary. Following Grinsted et al. (2004a, b), the coefficient of wavelet coherence is convey as follows:

$$R^2(x, y) = \frac{|S(s^{-1}W_{xy}(u, s))|^2}{S(s^{-1}|W_x(u, s)|^2)S(s^{-1}|W_y(u, s)|^2)} \tag{3.9}$$

The coefficient of coherence between two time series ranges between $0 \leq R^2(x, y) \geq 1$. A value near to 0 signifies a weak correlation; however, a value near to 1 signifies a strong correlation. In addition, we use phase difference proposed by Torrence and Compo (1998) to establish in information on direction of co-movement (positive or negative co-movement), also on causal relationship between time series.

The phase difference between the time series $x(t)$ and $y(t)$ is mentioned as follows:

$$\Phi_{xy} = \tan^{-1}\left(\frac{\mathfrak{J}\{W_n^{xy}\}}{\mathfrak{R}\{W_n^{xy}\}}\right), \Phi_{xy} \in [-\pi, \pi] \tag{3.10}$$

where $\mathfrak{J}$ and $\mathfrak{R}$ are the imaginary and real parts of the smoothed cross-wavelet transform, respectively. The wavelet coherence plots indicates the phase difference presented by black arrows and directional arrows are applied to mentioned different phase. If the arrows directed to the right (left) when $x(t)$ and $y(t)$ are in phase (out of phase). Likewise, if the arrows point down (up) means $y(t)$ $(x(t))$ is leading.

There are few motives of using the wavelet approach: first, the stationarity of time series can be relaxed. Second, it does not require normality in a time series; third, it have an ability for capturing non-linear relationships; fourth, it can determine the direction and the association between two time series in short, medium and long terms (Grinsted et al. 2004a, b; Ng and Chan 2012; Vacha and Barunik 2012).

3.3 Empirical Findings

3.3.1 The CWT (Continuous Wavelet Transforms) Outcomes

Next figures exhibit the CWT (continuous wavelet transforms) for every indicator. The CWT trace the movement for each time series both in period-levels and frequency ensembles.
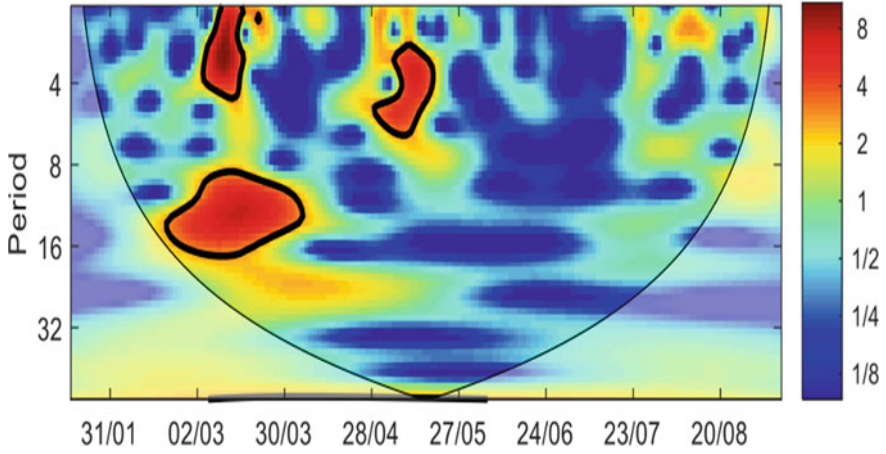
Fig. 3.7 Plots for Bitcoin
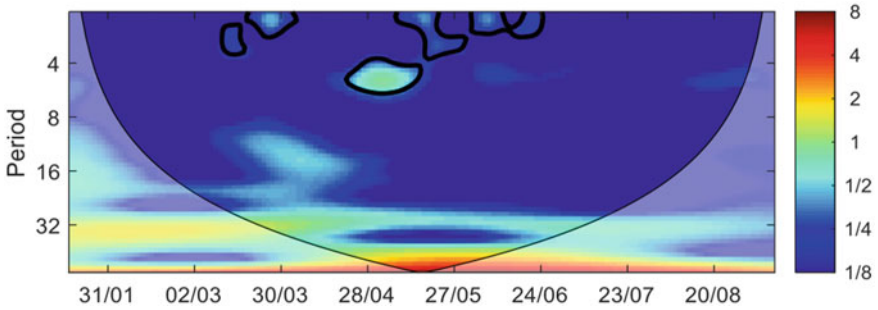
Fig. 3.8 Plots for US COVID-19

Figure 3.7. shows CWT of Bitcoin, the CWT plot revealing three islands of strong volatilities, the first range to 1–4 days frequency bands during the first mid of March 2020. Furthermore, we notice a strong variation during this period when the Bitcoin has down 45% (8 945 0.875 $ on March 2, 2020 to 4 926.400$ on March 16, 2020). While, the second, range to 4–8 days frequency bands during the end of April to mid-May 2020. The third, range to 8–16 days frequency bands during mid-February to beginning of April 2020.

Figure 3.8. plots the CWT of US COVID-19 infected cases which shows two considerable variation in the frequency area of 1–4 days over mid-March to beginning April 2020, for this period the number of infected cases passe de 224 cases on March 10,2020 to 26 298 cases on April 03, 2020.

The second contour records a comparatively elevated intensity of volatility through the end of April to mid May 2020.
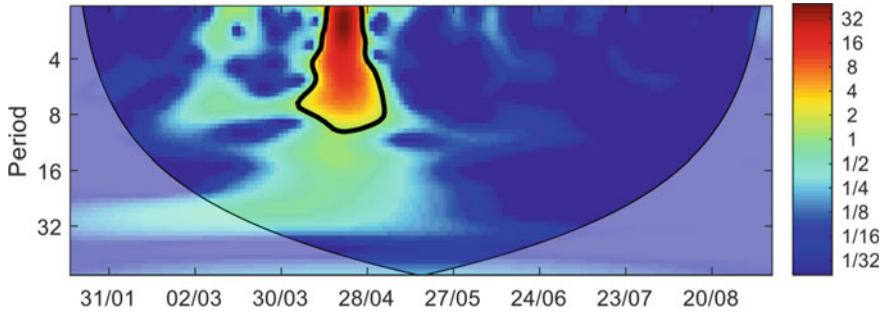
Fig. 3.9 Plots for WTI
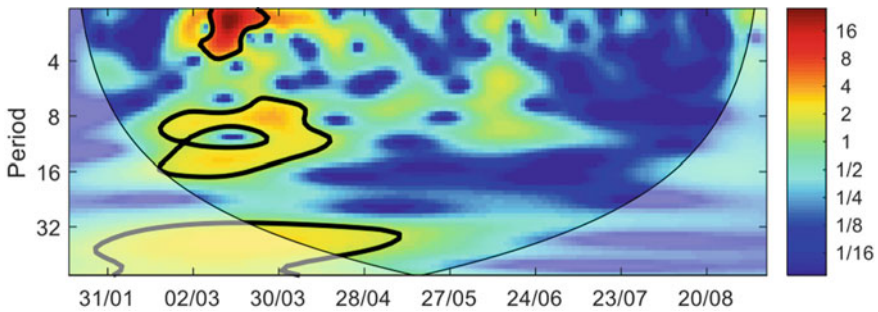
Fig. 3.10 Plots for S&P500

Figure 3.9 presents the CWT of WTI, for the WTI the CWT reports a significant volatility, leading in frequency groups of 0–4, 4–8, and 8–16 days through the April 2020. This volatility can be explained by the unexpected decision of Saudi Arabia and the increase number of infected cases. The island over brief-run (1–4 times frequency groups) presented a significant variations in crude oil prices between mid-April to end April 2020.

Figure 3.10 describes the CWT of S&P500, for US stock market index (S&P500) records a considerable island mentioned of elevated volatility throughout the brief-run (long-run) (0–4 days frequency bands) and long-run (8–16 days frequency band) during end of February to mid of April. The forte volatility for this period can be explained by the meltdown in crude oil after the unanticipated value reduction by the Kingdom of Saudi Arabia.

Also, we can confirm that the elevated volatility of US stock markets can be clarified by the bad announcement associated to the exponential trend in USA the US COVID-19 infected cases.

As seen from the continuous wavelet transforms plots, thus findings have shown a high volatility for all variables of US financial markets related to the bad announcement fundamental to the COVID-19 epidemic. Furthermore, these findings suggest that the high volatility is concentrated especially from the beginning of February to end of May.

3.4   Co-movement Between COVID-19 Confirmed Cases in USA and Financial Market of US

In this section, we investigate the co-movement between COVID-19 confirmed cases in USA and financial market of USA presented by S&P500 index, WTI crude oil prices, and Bitcoin. Figure 3.11 demonstrates the wavelet coherence plots and stage discrepancy among COVID-19 confirmed cases in USA and each variables. The coherency between couple variable varies from blue (low coherency) to red (high coherency).

The wavelet coherence between COVID-19 in USA and crude oil price reported in Fig. 3.11 reveals a small island of high degree of dependence, in the frequency variety of 1–4 groups through March 5 to March 23,2020 corresponding to a meltdown in crude oil prices (level 20$ baril WTI) and the increase of the number of confirmed cases in the USA (level 30,000 cases by day). In the following periods, we observe a high dependence in the frequency bands span of 16 days to forwards through march 27 to May 22, 2020 can be explained by the free fall of oil prices (territory negative −37$ per baril). We also see two island of high degree of dependence range to 4–8 days frequency bands, respectively, from June 12 to June 18,2020 and over July 15 to August 21.

Furthermore, arrows point turned down and left which means that the US Covid-19 and WTI are in phase, indicating a negative correlation and the COVID-19 infected cases in USA led crude oil price during sanitary crisis.

Figure 3.12 reports the wavelet coherence between COVID-19 infected cases in USA and stock index of USA which show two small areas of strong dependence for March 5 to March 19 and for the March 25 to April 21 across the 1–4 days frequency bands. The response of S&P500 can be explained by the bad announcement relative
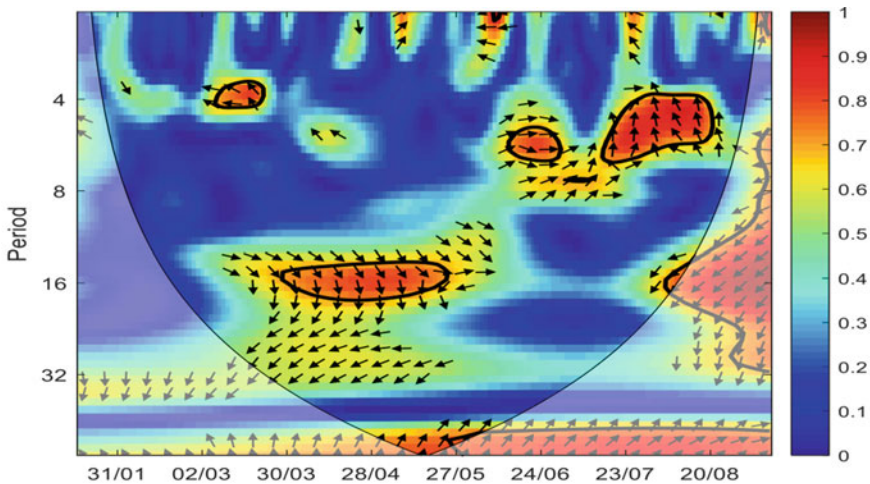
Fig. 3.11 Wavelet coherence plots between US COVID-19 infected cases and WTI
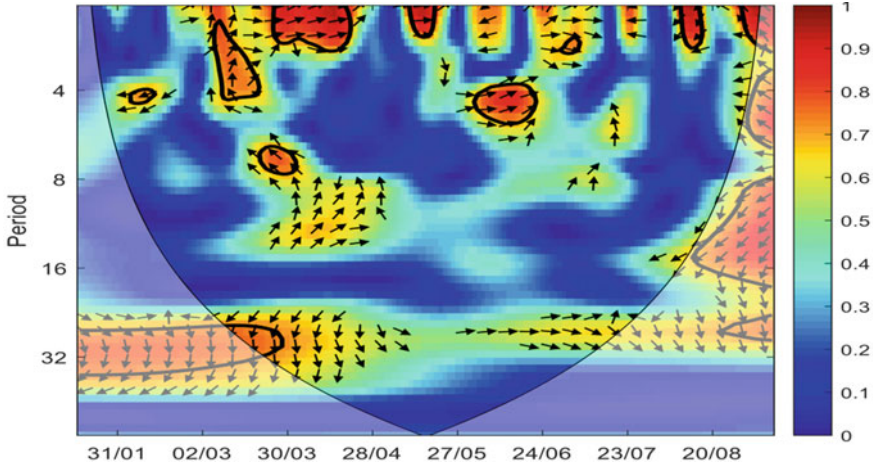
Fig. 3.12 Wavelet coherence plots between US COVID-19 infected cases and S&P500
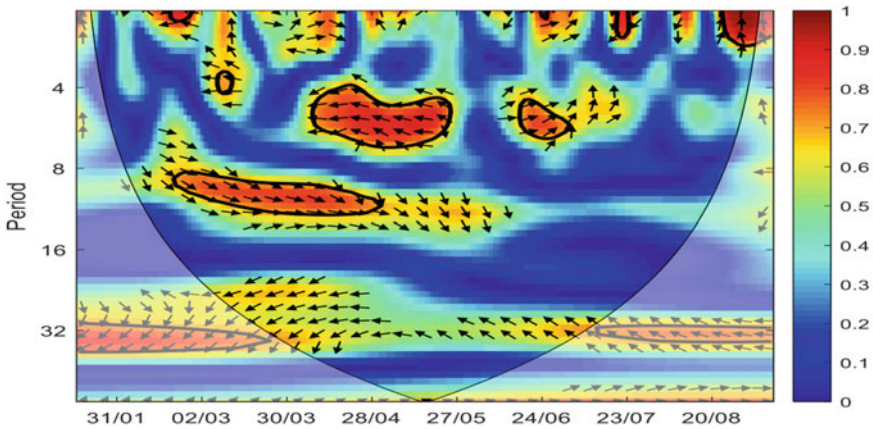
Fig. 3.13 Wavelet coherence plots between US COVID-19 infected cases and Bitcoin

to the US authorities for the initial coronavirus death on February 29, 2020, to the quantity of worldwide cases which attain a total of 87.000 cases, by the declaration of WHO which consider the COVID-19 as global pandemic, and by the free fall of crude oil prices on March 26 (Fig. 3.13).

We also detect the presence of small island of high co-movement during March 19 to April 2 and June 02 to June 23 over 4–8 days frequency groups. For June 2020, the high co-movement between US COVID-19 and S&P500 can result in the sharp rise in confirmed cases reported in Florida and South Carolina. We also clarified causality and phase differences between S&P500 index and COVID-19 confirmed cases in US. We notice generally that the pattern of co-movement between S&P500

and COVID-19 confirmed cases in USA is in phase. In other words, the pattern of co-movement shows that COVID-19 in USA leading stock market of USA throughout COVID-19 pandemic.

Figure 3.11 indicates that the wavelet consistency plot among the index-pair of COVID-19 in US and Bitcoin, we identify the existence of huge islands a long-run of high dependence. The red color inside the circle supports a high relationship of approximately 0.8 mean the representing a strong association between US COVID-19 and Bitcoin in the frequency range of 8–16 days during February 20 to April 30, 2020, Moreover, another high coherency over 4 to 8 times frequency bands during April 07 to May 26, 2020.

At the same time, the cryptocurrency markets (Bitcoin) seems to influence to bad news: conforming to some COVID-19 epidemic bad announcements such as the stated initial patient death in USA on the date of February 28, 2020; the announcement of WHO on March 12, 2020; declaration Donald Trump on March 13, 2020; the number of infected cases in USA elevated to 20,000 and furthermore the meltdown in crude oil after the unanticipated price reduction by the Kingdom of Saudi Arabia.

We observe a significant high dependence between US COVID-19 and bitcoin across the 4–8 days frequency band during June 16, 2020 to July 02, 2020. The dark red color inside circle indicated an association about 0.9 as exposed by the color bar exposed a great impact in short-run of COVID-19 infected cases in US on cryptocurrency markets (Bitcoin). The arrows are mainly.

Additionally, we find that the US COVID-19 infected cases have a greater effect on the price of crude oil then the stock market of USA and cryptocurrency markets. These results approve the COVID-19 outbreak.

Notes: the level of correlation is mentioned by color from blue to red, the horizontal axis presents time, the vertical axis indicates the time in days, and the black curve indicates the 5% relative to the significance level. The relative stage association is presented as pointing symbols: Right: in-stage; Left: anti-stage; down: initial series running second series by 90°; up: second series running first series by 90°.

3.5   Conclusions

In our paper, we examine the importance of time–frequency co-movement among the current COVID-19 pandemic, US stock market (S&P500), crude oil price (WTI), and cryptocurrency markets (Bitcoin) utilizing mutually the continuous wavelet transform and the wavelet-based methodology. We conclude signal of volatility, strong dependence, connectedness, and stage discrepancies at low frequency bands (1–4 days and 4–8 days) recorded particularly over February to April, 2020 between US COVID-19 infected cases and each variable (S&P500, WTI, Bitcoin). Our finding confirmed that the financial markets not only influenced by the geopolitical risk, policy uncertainty, and financial stability, but also by the health crisis. Therefore, the result confirmed that the COVID-19 is a systematic risk.

Although the matrix of correlation results an increase in correlation between financial market index during US COVID-19 which mean the reduce of diversification benefits during US COVID-19 infected cases from S&P500, WTI, and Bitcoin portfolio combinations. The US investors and speculators supported risk fundamental to the chaotic outbreak of the COVID-19 pandemic as a systematic risk vibrating the oil price, the stock market of US, and Bitcoin.

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Chapter 4
COVID-19 Surprises in China and in the USA: Which Is Useful in Explaining the Dynamic Nexus Among Energy Commodities and Bitcoin?

Abdelkader Derbali [ID]**, Kamel Naoui** [ID]**, and Lamia Jamel** [ID]

Abstract This study investigates an important approach to assess the impact of the COVID-19 confirmed cases surprises and creation pronouncements used for the correlation among returns and volatilities of energy commodities and Bitcoin. To evaluate empirically the unanticipated factor of the COVID-19 confirmed cases surprises in China and in USA, we use the (Kuttner 2001) approach, and we employ the total of the COVID-19 confirmed cases in China and in USA to calculate the surprise element. Econometrically, we apply the GARCH-DCC(1,1) model as established by Engle (2002). The empirical findings of this article recommend important and significant correlation among energy commodities and Bitcoin indices if COVID-19 pandemic shocks are integrated in variance estimations. Also, these findings prove the financialization phenomena of energy commodities and Bitcoin indices. We remark that the correlation among energy commodities and Bitcoin indices begin to react significantly further in the case of COVID-19 in China than COVID-19 in USA. Finally, our research contributes to the financial literature on assessing the influence of the COVID-19 surprises on the correlation among returns and volatilities of energy commodities and Bitcoin through the period of study since July 01, 2019 to June 30, 2020.

Keywords COVID-19 surprises · Bitcoin · Energy commodities · Pandemic · Correlation

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53

4.1 Introduction

In less than 6 months, the new coronavirus (COVID-19) has transformed from a simple ordinary viral epidemic into a global pandemic, threatening to cause serious changes that may well transform the world as we have known it for good now.

Many have already called this latest pandemic a "third world war." However, specific measures have been taken. These measures aim to limit the worsening of the situation and to prevent the shutdown of the world in virtually all sectors of activity.

Schools, tourism, transport, public, sporting, electoral events, almost everything is postponed or put on hold, which will inevitably affect everyone's social and economic life. Thousands of cases of contagion and death have already been recorded around the world, and at the mere thought of this pandemic not going away anytime soon and the stock markets are taking a heavy toll as they record all-new lows, which no had known more for years.

The S&P 500 Index reached a brand-new "low" ever since 2008, when the world tumbled interested in a global financial and economic crisis. Then, the cryptocurrencies market is much further unstable and has additionally suffered one of the most terrible unexpected declines in its record. At the end of March 2020, a 6% drop in prices was recorded within 24 h. Thus, investors and traders have made a desperate change from "risky" assets to considerably "sounder" assets like gold and oil, which have been on a strong turn ever since the beginning of the COVID-19 pandemic.

Through China and South Korea taking around 70% of the extracting capacity of Bitcoin (the biggest cryptocurrency), it is simple to declare that the enormous influence was anticipated as the virus launched to inflict destruction on the world economy especially, Asian countries. In recent years, a lot of cryptocurrency mining equipment has been implemented. The declining prices at the moment are hurting the performance of these mining machines. To balance the new algorithms, mining operations are now more and more dependent on this equipment, which has become inefficient. Isolation and quarantine have become the main causes, as there is less movement to mining farms. Prices continue to fall despite current forecasts, with an overall drop of 15% at the end of March.

Unexpected incidents, comprising the terrorist attacks and healthy crisis, will result surprise, panic and fear between the international investors and consequence in the quick panic-selling reaction (Burch et al. 2016; Elali 2021). A developing grouping of economic and financial framework, such as the studies of Carter and Simkins (2004), Chen and Siems (2004), Nikkinen et al. (2008), Kollias et al. (2011), Derbali and Jouini (2019), and Papakyriakou et al. (2019), which has forwarded the influence of the terrorist attacks on the global financial stock market indices. Jamel and Derbali (2019) show that terrorism factors is a significant and important component in clarifying the estimate volatilities of the stock market returns in the situation of the DSEWI (Damascus Securities Exchange Weighted Index), which must be approved into explanation after assessing volatility. Also, Ye and Karali (2016) employ an intraday dataset to investigate the reaction of the crude oil returns and volatilities to supply announcements through the Energy Information Administration

(EIA) and the American Petroleum Institute (API) throughout the using period of study from August 01, 2012, to December 31, 2013. From their empirical findings, they assume that supply surprises in mutually API and EIA announcements have an instantaneous inverted influence on the returns and a significant and positive influence on the volatility. Similarly, Halova et al. (2014) demonstrate at an intraday dataset to assess the effect of the unanticipated component in the EIA's crude oil accounting announcements on mutually the return and the volatility. Halova et al. (2014) show that the energy returns react further significantly to unanticipated adjustments in the supply degrees throughout the insertion period than across the removal progression.

The pandemic propagation will certainly have the similar influence. Nippani and Washer (2004) concentrate on the stock market indices of 8 really influenced economies through the SARS epidemic propagation and conclude that the SARS pandemic had no undesirable and bad effect on the financial stock markets of the influenced nations' with the exemption of China and Vietnam. In the same context, Chen et al. (2007) examine the effect of the SARS epidemic on the profitability of the hotel stocks in exchanges of Taiwan and the Chinese mainland and conclude considerable and negative influence.

He et al. (2020) tries to investigate and assess the direct impacts and spillovers of the COVID-19 on the financial stock markets of b countries. By employing a conventional *t*-tests and a non-parametric Mann–Whitney assessments, He et al. (2020) investigate empirically the daily return dataset from the financial stock market in China, Japan, South Korea, Germany, Spain, Italy, France, and USA. Their empirical findings demonstrate that the COVID-19 pandemic has a negative and significant but in short-term influence on the financial stock markets of the influenced countries. Also, they find that the effect of the COVID-19 pandemic on the financial stock market indices of selected countries has bidirectional spillover impacts among Asian economies and European and American economies.

Sansa (2020) commences to examine the influence of the propagation of the COVID-19 on the financial stock markets in China and in USA through the period of study since March 01, 2020, to March 25, 2020. Additionally, Sansa (2020) indicates the existence of positive and considerable connection among the spread of the COVID-19 pandemic cases and whole the used international financial stock market indices (such as, New York Dow Jones and Shanghai stock exchange) during the period of study since March 01, 2020 to March 25, 2020 in USA and in China. Then, these findings imply that the COVID-19 pandemic had a considerable influence on international financial stock market indices since March 01, 2020 to March 25, 2020 in China and in USA.

This paper is very directly connected to the recent financial and economic literature in the response of the correlation among the returns of Bitcoin and the energy commodities (Crude Oil West Texas Intermediate, Brent Oil, and Natural Gas) to the COVID-19 surprises in USA and in China through the used period of study since July 01, 2019 to June 30, 2020. Therefore, it is crucial to consider a fundamental connection among the heathy crisis surprises and the volatility of financial stock market indices returns, particularly, energy commodities and Bitcoin returns.

Therefore, we study in our article the coronavirus confirmed cases surprises in USA and in China as a possible factor of the volatility of energy commodities and Bitcoin returns is of significant important specified used period of rapid catastrophe of the international financial stock market indices and the main role of the healthy crisis actions on the financial asset values. In this research, we investigate empirically the moment-varying connections among strategic commodities including segment of energy (Crude Oil West Texas Intermediate, Brent Oil, and Natural Gas) and Bitcoin, through the period of study since July 01, 2019 to June 30, 2020. Econometrically, we employ the GARCH-DCC(1.1) approach with integrating of the coronavirus confirmed cases surprises in USA and in China.

The empirical findings of this paper validate a considerable correlation among Bitcoin and energy commodity indices if coronavirus confirmed cases surprises are included in variance estimations. These findings demonstrate the existence of the financialization of energy commodity markets and Bitcoin. Additionally, the empirical findings associated to the degree of the tenacity of the volatility are susceptible in the existence of healthy crisis shocks into the employed GARCH-DCC(1,1) methodology. The DCC among Bitcoin and selected energy commodity indices emerge to react significantly additional in the case of coronavirus confirmed cases surprises in China than the coronavirus confirmed cases surprises in USA.

Finally, this research is structured as follows: in Sect. 4.2, we describe the econometric procedure employed in this paper. In Sect. 4.3, we present the dataset utilized in our investigation. Sect. 4.6 exposes the empirical outcomes relative to the influence of coronavirus confirmed cases in USA and in China on the association among energy commodity and Bitcoin. Finally, in Sect. 4.7, we conclude, and we present some important policy implications of this study.

4.2 Methods

The econometric methodology utilized in our research which goes to assess returns and volatilities of the energy commodities and Bitcoin reactions to the COVID-19 epidemic shocks declared by USA and China based on the Dynamic Conditional Correlation multivariate specification (Engle 2002).

The Dynamic Conditional Correlation (DCC) technique has the elasticity of univariate specification of GARCH model (generalized autoregressive conditional heteroskedasticity) however does not permit since the "expletive of dimensionality" of a multivariate GARCH models (generalized autoregressive conditional heteroskedasticity). The assessment of GARCH-DCC specifications requires of two steps. We assess, in the first time, the conditional mean of returns and the conditional mean of variance of all indices employed in our research. In the phase 2, we employ a dependable regression residual established in the phase 1 to evaluate the conditional connections among energy commodity indices and Bitcoin through COVID-19 in China and COVID-19 in USA surprise statements.

Then, to achieve the reaction of energy commodities returns correlated with bitcoin just on the shock factor, we utilize the subsequent model: GARCH(1,1) model (generalized autoregressive conditional heteroskedasticity) is carried by the equal (4.1):

$$h_t = \omega + \alpha \varepsilon_{t-1}^2 + \beta h_{t-1} \tag{4.1}$$

With, the coefficients ω, α and β relate to the coefficients that need to will be assessed. Then, the estimate conditional connection matrix R_t of the homogeneous disturbances ε_t which is suggested with:

$$R_t = \begin{bmatrix} 1 & q_{12t} \\ q_{21t} & 1 \end{bmatrix} \tag{4.2}$$

With, $\varepsilon_t = D_t^{-1} r_t$ and the estimate matrix R_t can be obtained as follow:

$$R_t = Q_t^{*-1} Q_t Q_t^{*-1} \tag{4.3}$$

With, Q_t represents the time-varying covariance matrix of ε_t and Q_t^{*-1} represents the inverted transverse matrix alongside throughout the square root of the transverse fundamentals of Q_t. Then, by revealing that Q_t^{*-1} is corresponding to the following equal:

$$Q_t^{*-1} = \begin{bmatrix} 1/\sqrt{q_{11t}} & 0 \\ 0 & 1/\sqrt{q_{22t}} \end{bmatrix} \tag{4.4}$$

Therefore, the specification GARCH-DCC(1,1) is obtained by the following equivalent:

$$Q_t = \omega + \alpha \varepsilon_{t-1} \varepsilon_{t-1}' + \beta Q_{t-1} \tag{4.5}$$

With, $\omega = (1 - \alpha - \beta)\overline{Q}$, where $\overline{Q}$ represents the unconditional covariance of the standardized disturbances noted by ε_t. ω, α, and β represent the assessed coefficients. Additionally, this paper contributes to the economic and financial literature via the integrating of an additional indicator in the specification GARCH-DCC(1,1) which evaluate the coronavirus surprise in USA and in China. Therefore, our estimated model is presented by the following equal:

$$Q_t = \omega + \alpha \varepsilon_{t-1} \varepsilon_{t-1}' + \beta Q_{t-1} + \gamma S_t \tag{4.6}$$

With, S_t suggests the unexpected COVID-19 surprise pronouncements at moment t. Focused on the approach of Kuttner, we compute the shock component by the scaled form of adjustment in one-day COVID-19 confirmed cases at an occurrence date (d characterized as a pronouncement of coronavirus confirmed cases in USA

and in China. Evidently, the surprise component for each COVID-19 confirmed case adjustments in China and in USA is offered by the Eq. (4.7):

$$S = \frac{D}{D - d}(f_d - f_{d-1}) \tag{4.7}$$

With, f_d indicates the declared number of COVID-19 confirmed cases at the ending of the statement day d, f_{d-1} indicates the declared number of COVID-19 confirmed cases at the ending of the declaration day $(d-1)$, and D indicates the total of days in each month included in the period used in our study.

4.3 Data Analysis

The dataset employed in our article include quotidian time series on the returns and the conditional volatilities of Bitcoin and selected energy commodities. Then, to investigate the direct influence of the COVID-19 cases surprises, we focused in the anticipated and shock elements in the COVID-19 cases change in China and the COVID-19 cases change in USA. Our data sample covers the period of study since July 01, 2019 to June 30, 2020. The data used in this paper are collected from two sources such as, https://markets.businessinsider.com/currencies and https://data.europa.eu/euodp/en/home. The choose of COVID-19 cases change in China and COVID-19 cases change in USA is justified by two things; (i) China is the country who present the first COVID-19 confirmed cases (ii) and USA is the most affect country by COVID-19.

We note, certainly, that whole used stock price indices of Bitcoin and energy commodities are transformed by the logarithm structure. We calculate the logarithmic return formula as $r_t = \ln(p_t/p_{t-1})$, with the variable P_t represents the stock market index at the moment t and the variable P_{t-1} represent the stock market index at the moment t–1.

4.4 Energy Commodities and Bitcoin

In the Table 4.1, we present most important descriptive statistics for the used quotidian returns of energy commodity indices and Bitcoin. Then, we demonstrate that shortest potential mean of daily return is equal to −0.001357 for the BRENT OIL but the biggest possible mean of daily returns is equal to 0.000645 for the CRUDE OIL escorted by BITCOIN with a quotidian return which equal to 0.000190 and the NATURAL GAS with a quotidian return which equal to −0.001265.

Then, for the volatility of quotidian return of energy commodity indices and Bitcoin, which calculated by the squared of the variance, we can reveal that BITCOIN presents a daily volatility of 0.045124 against CRUDE OIL WTI with a daily

Table 4.1 The descriptive statistics for quotidian returns

	BITCOIN	BRENT OIL	CRUDE OIL WTI	NATURAL GAS
Mean	0.000190	−0.001357	0.000645	−0.001265
Median	0.000137	0.003856	0.002137	0.000000
Max	0.503085	0.190774	0.319634	0.109620
Min	−0.151758	−0.279761	−0.282206	−0.093434
Std. dev	0.045124	0.043312	0.055769	0.032440
Skewness	4.135175	−1.350728	0.094680	0.304034
Kurtosis	53.09966	15.31220	14.66810	3.981847
Jarque–Bera	32,874.27	2025.824	1736.300	17.00557
Prob	0.00000*	0.00000*	0.00000*	0.00020*
Obs	306	306	306	306

Note Table recaps descriptive statistics of quotidian returns for Energy commodities indices and Bitcoin, such as Crude Oil West Texas Intermediate, Brent Oil, and Natural Gas. The period of study is since July 01, 2019 to June 30, 2020. The significance at the 1% threshold is denoted by *
Source Elaborated by authors

volatility of 0.055769. The shortest estimate daily instability is for NATURAL GAS (0.032440).

The coefficients of skewness statistic have a negative sign for the BRENT OIL variable. The distribution of the BRENT OIL is asymmetrical in the left. However, BITCOIN, CRUDE OIL WTI, and NATURAL GAS present an estimate coefficient of skewness with a positive sign. This result indicates that the distribution of BITCOIN, CRUDE OIL WTI, and NATURAL GAS are asymmetrical in the right. The presence of the identical make signs for these indicators supports the presence of a lowest correlations among them.

Also, our findings show that the estimated coefficients of the kurtosis statistic are completely bigger than the 0. This finding supports the presence of a leptokurtic distribution. Besides, the leptokurtosis is commonly utilized in the economic and financial literature, particularly with the heavier extensions than the normal distribution, necessitating supplementary numerous irregular values. Additionally, the estimated positive sign of the Jarque–Bera coefficient suggests that the null assumption of normal distribution of the indices utilized in our research can be eliminated. Moreover, the elevated-intensity value of the Jarque–Bera coefficient shows that the used financial time series is non-normally dispersed.

Finally, the estimated values of skewness, kurtosis, and Jarque–Bera coefficients of the various indices utilized in this research recommend that the dispersion of the estimated coefficient of each variable are not normally scattered. So, we can reject the null hypothesis of the ordinariness of the financial time series of the outputs at a level of one percent.

Furthermore, a study of the causal relationship among Bitcoin and energy commodities requires stationarity tests to justify the order of incorporation of each

index. The outcomes of the Levin-Lin-Chu examination, the Im-Pesaran-Shin examination, the Augmented Dickey-Fuller examination and the Phillips Perron examination applied to the used indices are shown in Table 4.2. Therefore, the acceptance or rejection of the null assumption of the test is based on the value of the probabilities and statistics relating to the recommended tests. These probabilities are compared to a threshold of 10%. If these probabilities are inferior to 10%, so we reject the null assumption which implies that the used series are non-stationary and if these probabilities are superior to 10%, so we accept the null assumption. In our context and based on Table 4.2, we can remark that all employed series are stationary in level according to the Lin-Chu examination, the Im-Pesaran-Shin examination, the Augmented Dickey-Fuller examination, and the Phillips Perron examination.

The Table 4.3 recapitulates main statistical characteristics for the unconditional correlation matrix among Bitcoin and energy commodities. Founded on the unrestricted correlation shown in the Table 4.3, we show that Bitcoin have a negative relationship with the BRENT OIL. Additionally, we find that Bitcoin have an important positive connection with CRUDE OIL WTI and NATURAL GAS. This finding validates that COVID-19 surprises can explains the spillover effects of Bitcoin in energy commodities indices.

The Fig. 4.1 gives the progression of quotidian returns of used indices such as Bitcoin and energy commodities. For Bitcoin index, we can observe that elevated

Table 4.2 The unit root test

Procedure	Statistic	Prob.**	Cross-sections	Obs
Null assumption: presumes common unit root method				
Levin, Lin & Chu (LLC) t^* test	−39.7787	0.0000	4	1219
Null assumption: presumes individual unit root method				
Im, Pesaran and Shin (IPS) W-stat test	−35.3501	0.0000	4	1219
ADF–Fisher Chi-square test	521.773	0.0000	4	1219
PP–Fisher Chi-square test	542.782	0.0000	4	1220

Note Table 4.2 recaps unit root test of daily returns of Bitcoin and energy commodity indices. The data period is from July 01, 2019 to June 30, 2020
Source Elaborated by authors

Table 4.3 Unconditional correlation between Bitcoin and Energy commodities

	BITCOIN	BRENT OIL	CRUDE OIL WTI	NATURAL GAS
BITCOIN	1	−0.025413	0.004404	0.157634
BRENT OIL	−0.025413	1	0.173947	−0.086041
CRUDE OIL WTI	0.004404	0.173947	1	0.150694
NATURAL GAS	0.157634	−0.086041	0.150694	1

Note This table recaps unconditional correlation matrix between quotidian returns of energy commodity indices and Bitcoin. The data period is from July 01, 2019 to June 30, 2020
Source Elaborated by authors
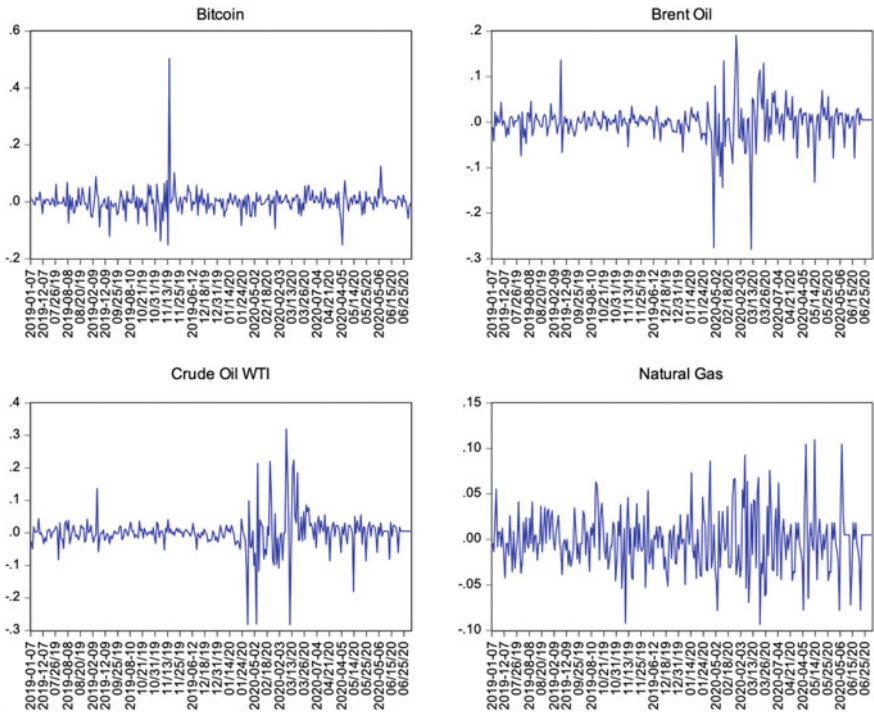
Fig. 4.1 Daily returns of energy commodity indices and Bitcoin over the period of study since July 01, 2019, until June 30, 2020. *Source* Elaborated by authors

variability is seen in November 2019. This period corresponds to pre-period of the first COVID-19 cases in the world, especially in China. Then, it can be observed that Bitcoin time series indicate several breaks in their estimated return progressions through the rest of period especially in April and May 2020. For the BRENT oil and CRUDE OIL WTI indices, we find that their returns exhibit some important breaks in their progressions mostly, in two period such as, February and March 2020 in which the propagation of COVID-19 is presented in all countries in the world. The NATURAL GAS index presents various important breaks in their return evolutions especially in the period from January to June 2020 in which many countries have declared that they have an important total of COVID-19 confirmed cases. The breaks observed in returns evolutions of the selected energy commodities can be explained by the importance of the effect of coronavirus surprises on the assessed returns and the volatilities of employed stock market indices.

In the Fig. 4.2, we present the progression of the conditional volatilities of the returns for the energy commodities indices and Bitcoin employed in this paper. It can be observed that the employed energy commodities indices achieve their maximum of their conditional volatility progressions in March 2020 which correspond to the announcement of the COVID-19 confirmed cases in all zones in the world. The main
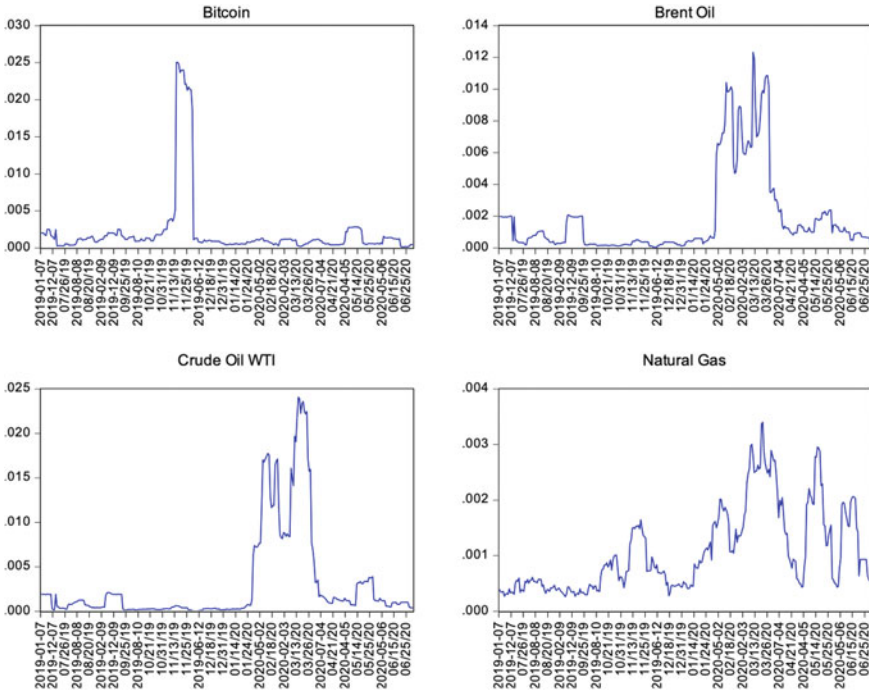
Fig. 4.2 The daily conditional volatility of Bitcoin and energy commodity indices over the period of study since July 01, 2019 until June 30, 2020. *Source* Elaborated by authors

conclusion demonstrates that COVID-19 surprises have a crucial and considerable effect on the energy commodities indices. For Bitcoin, we observe that conditional volatility of this asset reaches its maximum on November 2020, which indicates the pre-period of the COVID-19 pandemic propagation. Then, we can assume that COVID-19 news presents a relative impact on Bitcoin.

4.5 COVID-19 Surprises

Table 4.4 recaps the descriptive analysis founded on illustration of Chinese and USA COVID-19 announcements from July 01, 2019 to June 30, 2020. For instance, the period under consideration spans a total of 135 COVID-19 cases surprises in China (SC) and 121 COVID-19 cases surprises in USA (SUS). The average values of the changes of the COVID-19 cases surprises in China and US are, respectively, −7.332422 and 1.034788. It is interested to note that the standard deviation (which measures the volatility) of the COVID-19 cases surprises in China (SC) is greater than those of COVID-19 cases surprises in USA (SUS). This result implies that the

Table 4.4 Descriptive statistics for the surprise components in China and USA

	SC	SUS
Mean	−7.332422	1.034788
Median	0.000000	0.000000
Max	31.00000	35.00000
Min	−558.0000	−155.0000
Std. dev	48.61820	11.67731
Skewness	−7.559539	−7.382892
Kurtosis	72.01699	107.0619
Jarque–Bera	63,647.12	140,848.0
Prob	0.000000*	0.000000*
Obs	306	306

Note This table offers a summary of descriptive statistics for Chinese and USA COVID-19 cases announcement surprises. The period of study is since July 01, 2019 to June 30, 2020. The COVID-19 cases statements shocks are accumulated from the website: https://data.europa.eu/euodp/en/home. The used period contains 135 Chinese pronouncements and 121 US declarations. Also, we follow Kuttner (2001) approach and identify the revealed shocks by the using of the one-day adjustment in COVID-19 cases for each day. The statistical significance at threshold of (1%) is represented by (*)
Source Elaborated by authors

COVID-19 surprises in China is very important and significant than the COVID-19 surprises in USA.

The statistics of skewness statistics are all negative. Then, the negative sign of estimated coefficients of skewness indicates that the dispersion of both surprises is asymmetrical in the left. Also, the presence of identical sign for the calculated surprises validates a presence of a minutest relationship among the used variables. Additionally, we conclude that the kurtosis statistics are superior to 0. This finding indicates that we can eliminate the worthless assumption of normal dispersion of all series employed in this paper. Finally, all observed value of Jarque–Bera statistics indicate that we eliminate the worthless assumption of normal dispersion of all series utilized in this study. Then elevated point of the Jarque–Bera indicates that all series used in this investigation are not normally distributed (Fig. 4.3).

4.6 Empirical Findings

In the empirical investigation of this paper, we analyze the impact of the Chinese and the USA COVID-19 pronouncements on the dynamic correlation among he returns of energy commodities indices and Bitcoin. The econometric method applied in our article is the GARCH-DCC(1,1) specification instituted by Engle (2002).
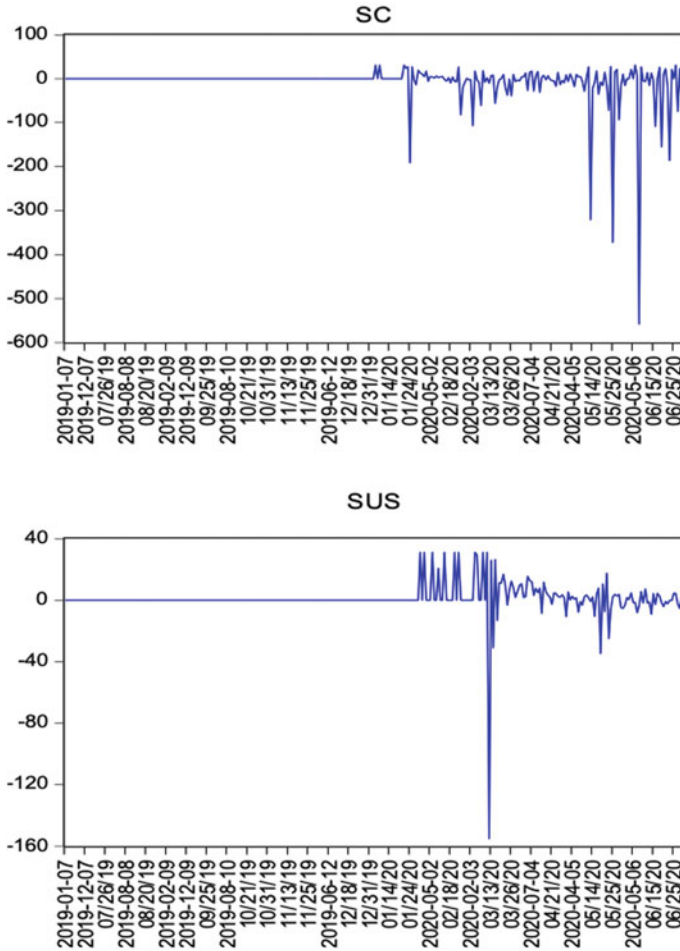
Fig. 4.3 Evolution of the coronavirus surprises in China and in USA over the period since July 01, 2019 until June 30, 2020. *Source* Own elaboration

Then, the dataset sample runs through the period of study since July 01, 2019 to June 30, 2020. Moreover, the selected energy commodity indices are the Crude Oil West Texas Intermediate, the Brent Oil, and the Natural Gas. Also, we utilize the methodology introduced by Kuttner (2001) which has established prevalent in the scholarly literature. In particular, we utilize the changes in the COVID-19 cases surprises.

Table 4.5 reports the main descriptive outcomes relative to the calculated DCC among energy commodities indices and Bitcoin during the existence of the COVID-19 shocks in China. Based on this table, we show that in the maximum the greater DCC is among Bitcoin and NATURAL GAS (0.954758) and among BRENT OIL and Bitcoin (0.951591). So, these findings indicate the important value of the 2

Table 4.5 Descriptive statistics for DCC among Energy commodity indices and Bitcoin with COVID-19 shocks in China

	Dynamic correlation among Bitcoin and		
	BRENT OIL	CRUDE OIL WTI	NATURAL GAS
Mean	0.213797	0.104885	0.239899
Median	0.244593	0.111030	0.225822
Max	0.951591	0.901249	0.954758
Min	−0.855726	−0.954353	−0.878611
Std. dev	0.477458	0.559638	0.495734
Skewness	−0.249711	−0.237341	−0.250691
Kurtosis	1.987241	1.750012	1.831494
Jarque–Bera	16.25755	22.79434	20.61408
Prob	0.000295*	0.000011*	0.000033*
Obs	306	306	306

Notes This table gives brief statistics of correlation among Energy commodity indices and Bitcoin, specifically the Crude Oil West Texas Intermediate, the Brent Oil, and the Natural Gas in existence of the COVID-19 shocks in China. The used period is from July 01, 2019 until June 30, 2020. The variable significant at the (1%) threshold is characterized by (*)
Source Elaborated by authors

energy commodity indices such as Natural Gas and Brent Oil in the financial stock markets. Additionally, these results demonstrate a significant DCC among energy commodities indices and Bitcoin principally during the period with the presence of the COVID-19 shocks in China. Also, we remark the importance impact of the COVID-19 surprises in China in financial stock markets particularly, for the return and volatility of the energy commodity classes.

In addition, Table 4.6 recaps the descriptive statistics for the estimated DCC among energy commodities indices and Bitcoin in the presence of the COVID-19 shocks in USA. Based on the Table 4.6, we prove that in the maximum, the greater DCC is among Bitcoin and NATURAL GAS (0.859792) and among BRENT OIL and Bitcoin (0.856938). These findings suggest the importance of the two energy commodity indices such as Natural Gas and Brent Oil in the international financial markets. Furthermore, this result demonstrates the high significance of the DCC among energy commodities indices and Bitcoin mostly during the presence of the COVID-19 shocks in USA.

Moreover, based on the Tables 4.5 and 4.6, we assume that the COVID-19 surprises in China are more significant than COVID-19 shocks in USA, principally in operation of financial markets. Also, we remark the existence of a considerable link among the coronavirus confirmed cases in USA and in China and the international financial market indices, mainly in the energy commodities and cryptocurrencies classes.

Besides, and looking at the daily time, we can confirm that shock factors in COVID-19 surprises in China adjustments have performed an essential function in the improvements of the volatility of most important energy commodities classes.

Table 4.6 Descriptive statistics for DCC among Bitcoin and Energy commodities with COVID-19 shocks in USA

	Dynamic correlation among Bitcoin and		
	BRENT OIL	CRUDE OIL WTI	NATURAL GAS
Mean	0.192531	0.094452	0.216037
Median	0.220263	0.099986	0.203363
Max	0.856938	0.811604	0.859792
Min	−0.770608	−0.859435	−0.791222
Std. dev	0.429966	0.503972	0.446424
Skewness	−0.224872	−0.213735	−0.225765
Kurtosis	1.789574	1.575942	1.649319
Jarque–Bera	14.64044	20.52703	18.56364
Prob	0.000265*	9.91E-06*	2.97E-05*
Obs	306	306	306

Notes This table gives brief statistics of correlation among Energy commodity indices and Bitcoin, specifically the Crude Oil West Texas Intermediate, the Brent Oil, and the Natural Gas in existence of the COVID-19 shocks in USA. The used period is from July 01, 2019 until June 30, 2020. The variable significant at the (1%) threshold is characterized by (*)
Source Elaborated by authors

These results are not shocking. The unique conceivable clarification likely is to provide the essential effect of the Chinese economy and financial market on the international financial markets and the world economy, and the announcements related to the changes in COVID-19 surprises in China may considerably affect the external economic basics and consequently the important volatility of the energy commodity indices and cryptocurrencies markets such as Bitcoin. Also, the significant effect of COVID-19 surprises in China in financial stock market can be justified by the spread of the coronavirus epidemic in China such as the first country which present the first confirmed cases in the world.

Subsequently, the shortest effect of COVID-19 surprises in USA is supported by the significance of the USA tactics to overshadow the global financial stock market indices and the international economic structure. Additionally, the COVID-19 surprises in USA have a considerable influence on the instabilities of the most important and most speculative energy commodities because the USA have the higher number of confirmed COVID-19 cases.

Table 4.7 summarizes the empirical outcomes relative to the Estimation of GARCH-DCC(1,1) specification among energy commodity indices and Bitcoin in presence of the COVID-19 shocks in China and COVID-19 shocks in USA. Several remarkable findings emerge from this empirical investigation. First, we can show that COVID-19 surprises in China and COVID-19 surprises in USA affect the DCC among energy commodity indices and Bitcoin. The negative sign relative to the coefficients of the COVID-19 surprises suggests that the changes on the confirmed cases of the COVID-19 in USA and in China drop the mean intensity of volatility of energy

Table 4.7 Estimation results of GARCH-DCC(1,1) among Energy Commodity indices and Bitcoin

Coefficients	ωi	αi	βi	COVID-19 shocks in China	COVID-19 shocks in USA
BRENT OIL	0.0532565 (2.44)**	0.1022055 (9.73)*	0.8856758 (66.12)*	−0.0524688 (−6.18)*	
	0.0352498 (2.31)**	0.0856252 (9.14)*	0.9100259 (45.31)*		−0.0418965 (−5.09)*
CRUDE OIL WTI	0.0456854 (2.02)**	0.1146854 (9.68)*	0.8619572 (57.97)*	−0.0385941 (−5.48)*	
	0.0433571 (2.19)**	0.0815234 (8.45)*	0.9005728 (38.47)*		−0.0122546 (−3.27)*
NATURAL GAS	0.0235652 (2.65)*	0.1250048 (8.28)*	0.8700254 (42.61)*	−0.0755285 (−6.62)*	
	0.0533248 (2.05)**	0.0923281 (6.01)*	0.8966582 (36.71)*		−0.0580701 (−4.14)*

Notes This table summarizes the estimated parameters from the GARCH-DCC(1,1) specification. To estimate this specification, the authors employ the daily volatility series of the returns for Energy commodity indices and Bitcoin, specifically the Crude Oil WTI, the Brent Oil, and the Natural Gas during the period used in our study since July 01, 2019 to June 30, 2020. The variable significant at the 1%, 5%, and 10% points are characterized by *, ** and ***, correspondingly. The statistics in parentheses expose the estimated *t*-Student

commodities indices and the cryptocurrencies (Bitcoin). According to the influence of COVID-19 surprises in China and COVID-19 surprises in USA on the DCC among Bitcoin and chosen energy commodities indices in our paper, the empirical outcomes presented in the Table 4.7 indicate that the 1% increase in COVID-19 surprises in China causes a decrease of 0.0524688% in the dynamic correlation among the returns of BRENT OIL and Bitcoin, and correspondingly, 0.0385941 and 0.0755285 for the dynamic correlations among the returns of Bitcoin and the CRUDE OIL WTI and the NATURAL GAS.

Moreover, we can show that 1% elevation in the COVID-19 surprises in USA causes a decrease of 0.0418965% in the dynamic correlation among the returns of the BRENT OIL and Bitcoin, and correspondingly, 0.0122546 and 0.0580701 for the dynamic correlations among the returns of Bitcoin and with the CRUDE OIL WTI and the NATURAL GAS. In the same context, we remark that the significant distinction among COVID-19 surprises in China and COVID-19 surprises in USA and their effect on the dynamic correlation among energy commodity indices and Bitcoin. Our empirical findings demonstrate that the COVID-19 has a considerable and negative but short-term influence on the international financial stock markets. Also, we find that the influence of the COVID-19 on the stock market indices has a bidirectional spillover effect among energy commodity indices and Bitcoin.

Additionally, we present a justification that the totality of the estimated volatility coefficients ($\alpha+\beta$) is very adjacent to the unity (1), for the situation of the estimated dynamic conditional correlation among energy commodity indices and Bitcoin

as showing representing an elevated persistence and perseverance of the volatility among COVID-19 surprises in China and COVID-19 surprises in USA and energy commodity markets and cryptocurrencies indices. Then, we can demonstrate the existence of one potential explanation which demonstrates that an important persistence goes along through the financialization of the international financial stock market indices, the cryptocurrencies markets, and the health crisis propagation, such as energy commodity indices and Bitcoin and COVID-19 pandemic (Creti et al. 2013; Chebbi and Derbali 2015, 2016a, b; Derbali and Jouini 2019; Derbali and Bouzgarrou 2020; Derbali et al. 2020a, b). The empirical results of our paper highlight the significance of utilizing the GARCH-DCC(1,1) specification in demonstrating the important time-varying of the dynamic conditional correlations among energy commodity indices and Bitcoin in the occurrence of the health crisis (COVID-19).

4.7   Conclusion

Generally, the relationships among energy commodity indices and Bitcoin have appreciated remarkable literature throughout the previous two decades. Numerous important improvements have been directed to enhance the estimated results. Among these developments, we observe an existence of the monetary policy shocks in the estimated volatility models, the political instabilities shocks, and the health crisis shocks (after COVID-19). These categories of shocks in the volatility possibly will be affected by the country-detailed financial and economic events, regional and global financial and economic impacts (e.g., the 2007–2008 financial crisis surprises, the European sovereign-debt crisis surprises in 2010, the 2011 Arab Spring surprises, the FOMC monetary policy surprises, the ECB monetary policy surprises, and the COVID-19 pandemic surprises).

In our study, we examine the conditional associations between Bitcoin and important commodities which cover the sector of energy (Crude Oil WTI, Brent Oil, and Natural Gas), throughout the period of study since July 01, 2018 until June 30, 2020. Then, we employ the GARCH-DCC(1.1) approach with integrating of COVID-19 surprises in China and COVID-19 surprises in USA. Our empirical findings in this study recommend great considerable DCC among energy commodity indices and Bitcoin if COVID-19 shocks are integrated in the estimated variance equation. Our findings demonstrate the presence of the financialization phenomena of energy commodity indices and Bitcoin. Additionally, our estimation findings associated with the intensity of the perseverance of the volatility are vulnerable in the existence of the COVID-19 shocks in the GARCH-DCC(1,1) specification. The dynamic correlations among energy commodity indices and Bitcoin appear to respond significantly further in the presence of the COVID-19 shocks in China than the COVID-19 shocks in USA. Furthermore, our findings presume that the behavior of the energy commodity, including Bitcoin flexibilities, suggests the recommendation that the energy commodity indices cannot create a homogeneous portfolio asset.

Finally, the effect of the COVID-19 shocks on the international financial stock markets present a bidirectional spillover effects among energy commodity indices and Bitcoin. Then, the important spread of the coronavirus in China and in USA negatively impacted the relationship among energy commodity indices and Bitcoin.

Our results contribute and add to the investigation in financial and economic effects of the current epidemic with giving an empirical proof that the COVID-19 present a bidirectional spillover impacts on energy commodities and cryptocurrencies indices. Our research has an important and significant issue for the policymakers and the portfolio risk supervisors and managers. Also, and from a policy-making perspective, getting truthful an experimental justification of the estimate volatility spillovers across international financial markets is an important and crucial stage in establishing useful monetary policy decisions and outcomes and healthy plans and strategies. For the perspective of portfolio risk administrators and executives, the outcomes of our paper are coherent to the recommendation of the cross-market hedging.

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Chapter 5
Corona Virus (COVID-19) Pandemic: Economic and Educational Responses and Aftermath Effects in Developing and Developed Countries

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Abstract The outbreak of novel infectious coronavirus pandemic is popularly known as COVID 2020-19; governments of many countries have taken several measures to curtail the spread of the virus among the populace. Since December 2019, the pandemic has spread rapidly (Wu and McGoogan 2020) propagating economic disruption globally and, in many cases, overwhelming health care resources (Grasselli et al. 2020). Among the measures suggested by World Health Organization (WHO) and implemented by governments include the total lockdown of number of cities across the globe. The total closure of business activities or some necessary physical distancing measures adopted to halt the wide spread of the disease has resulted to significant negative consequences on both businesses and workers (Anderson et al. 2020; Brenan 2020). Most of stock markets have recorded a more 50% decreases in stock prices, credit market activities were paralyzed, increased unemployment rate and decrease in the global GDP by at least 10%. In the United States of America (U.S.A), almost thirty percent of employment has been reduced the working circle, reduced working hours or frozen hiring because of the novel coronavirus outbreak, as par mid-March and part-time workers are more likely to be affected by these negative effects of the pandemic on their workplace (Brenan 2020).

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5.1 The Case of Nigeria

To cushion the effect of restriction of movements, several governments have offer number of palliatives to citizens. This was done with the intention of compensating them against the shutdown of their respective place of businesses. For example, the Federal Government of Nigeria has offered a three-month interest holiday on all government financed loans such anchor borrowers, Marketmoni, Tradermoni, and Agsmeis facilities. The president expands the number of beneficiaries of direct distribution of food and cash in the country by one million households from the initial two million six hundred thousand (2.6 million) households to three million six hundred thousand (3.6 million) vulnerable households. Moreover, the apex tax authority of the country introduced number of measures to simplify its process including extension of deadline for the filing of company income tax return by one month. Similarly, the central bank of Nigeria (the apex bank of the nation) has provided a special credit facility to the tune of 50 billion Nigerian naira ($129.5 million) for businesses and individuals that suffered substantial decline in income due to the COVID-19 pandemic.

With respect to education, on March 19, 2020, the Federal Ministry of Education has issued out a circular conveying an approval for the closure of all schools in country for an initial period of one month with effect from Monday March 23, 2020 to prevent the spread of the COVID-19 pandemic in the country (FME 2020). Each State in Nigeria has contextualized this circular and has affected over forty-six million children across the country. While most of the countries in the world have searched and offered alternative approach in teaching children through virtual engagements, little has been done in Nigeria in this regard. Children remain at home for over six months without advancing their learning capacity. Given the suddenness of this crisis and its impact to the education system, some international non-government organizations have made an attempt to mitigate the negative effects of school closure on children learning and teacher well-being. Parent and teachers provide learning support services to their wards and student through the use of e-learning and other media platforms (Jacob et al. 2020). However, these facilities and services were not hitch-free as the affordability and accessibility of the technological devices and constant electricity supply remain a mirage. Despite, the country has a lot of potential of redesigning its educational system in the wave of COVID-19 pandemic.

5.2 The Case of Malaysia

The second developing country under review is Malaysia. Malaysia is located in the South East Asia (Nienhaus and Hod 2020). Economically, it is the 4th largest economy of the region, making it one of the major influencers of economic variables in the region. The country economic activities have been performing very well and derived by increased demand for commodities, such as electronics, oil, and gas, an improving labor market and huge spending on infrastructural facilities (Nienhaus and Hod 2020). The country witnessed continuous growth in Growth Domestic Product (GDP) since 1980s. The country's export becomes a major catalyst for its economic growth. The country has recorded consistent annual GDP growth of up to 7%, with low inflation rate during the 80s and 90s. Despite the slow-down of the accelerated economic growth in the 2000s, the country continues recording positive economic growth ads presented in Fig. 5.1 (Islam et al. 2017).

However, the outbreak of COVID-19 in the last quarter of 2019 has paused the positive movement of the economic activities of the country (Azman et al. 2020). A report from the International Monetary Fund (IMF) in April 2020 estimated that the economic growth of the country will shrink to −1.7% in 2020. However, the economic activities are expected to pick up with the positive growth of up to 9% in 2021 depending of the post-pandemic economic recovery measures adopted across the world.

In order to hasten the economic recovery and minimize the pandemic negative consequences on its citizens, the Malaysian government has exempted all economic sectors from payment of HRDF levy for the period of six months effective from April 2020. Further, the government guarantees the payment of workers' salaries for a period of nine months for employees with less than RM 4,000 in a month. Similarly, a special grant of RM 3,000 is given to each qualifying micro SME and the micro SME
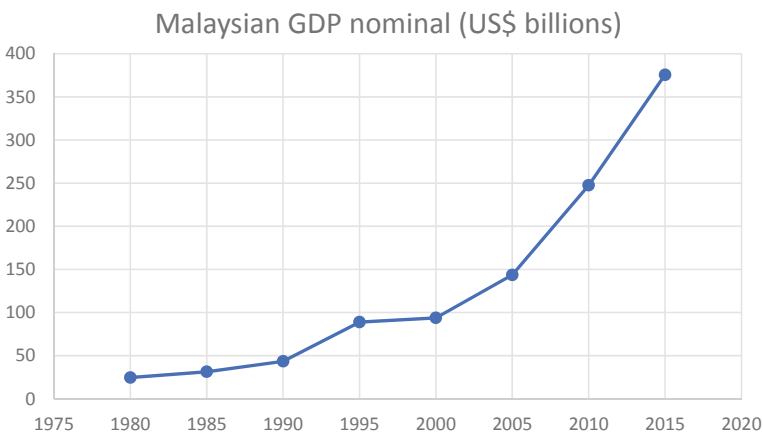
Fig. 5.1 Malaysian GDP

must register with the Malaysian Inland Revenue Board. Other economic stimulating packages include the abrogation of 2% interest rate for the RM500 million Micro Credit Scheme under Bank Simpanan Nasional.

On the educational activities, since the outbreak the Malaysian government closed all learning institutions on March 18, 2020. This has affected the learning of over five million students across the country. In an effort to keep learning process of the Malaysian children, the ministry of education has launched online teaching and learning platform nationwide. The program has kept more than three million children learning alive and has played significant contribution in education during the lockdown period (Chung et al. 2020).

To facilitate the smooth operation of the online teaching, a new platform Teacher Digital Learning Community was established with the support of UNICEF. The program is targeted at equipping teachers with the necessary skills and knowledge required to effectively deliver online teaching. The program has affected more than two thousand four hundred teachers from around one thousand six hundred schools across the country.

With respect to tertiary institution, most of the universities in Malaysia had an e-learning infrastructure for teaching and learning even before the outbreak of the pandemic. For instance, universities like Taylor's University has virtual site for each of its courses. This facilitates the continuation of academic activities such as assignments, assessment, peer support, and free flow of communication with peers and lecturers during the lockdown period. In addition, students have access to a Lecture Capture System (ReWIND), containing a variety of lecture recordings, and other learning materials (Azman et al. 2020). Large-scale courses also use live streaming and Lightboard Video Technology to record lectures.

5.3   The Case of Palestine

Most of the developing countries were affected the spread of COVID-19 pandemic with huge negative consequences on individuals and businesses. The effect is on both economy and the fragile healthcare system in those nations (Saleh et al. 2021). Palestine, being one of the developing nations, is posed by number of multiple challenges as a result of the outbreak of the COVID-19. These challenges include worsening living condition, increase poverty rate high instability among others (AlKhaldi et al. 2020). This can be termed as triple tragedies, viz.; the outbreak of the pandemic (COVID-19), Intra-Palestinian divide (Policies), and on-going Israeli occupation (Politics).

The moment the first cases of coronavirus COVID-19 infection were detected at a hotel in Bethlehem area, the Palestinian government has taken measures that exceed what is recommended internationally (Ahmad and Zabadi 2020; Saleh et al. 2020a, b). World Health Organization in Palestine praised the performance of the Palestinian government that has taken advanced measures to combat the spread of COVID-19 and praised the role of the Palestinian government in seriously managing this crisis.

Further, WHO indicated that the Ministry of Health is committed to WHO standards Global and that it is doing everything that can be done to limit the spread of the disease by means of patient examination, quarantine, and public health procedures to mitigate the negative effects on citizens. Palestine's response to the pandemic is outperforming many countries in the region. The fatality cases are relatively low in Palestine when compared to the rest of the region's countries. Fatalities were high in countries which have a high percentage of elderly people in the population, large population density, and those with weak testing, diagnostic, and treatment capacities (AMSE 2020).

The pandemic reaches its peak with the cumulative confirm cases of up to 26,764 as at August 27, 2020. These values are alarming and project a good picture to government on the potential health issues that may be unrevealed if appropriate measures are not taken (Dawoud 2020). However, the government fails to maintain the initial success story. The palliatives provided by Palestinian government were grossly inadequate. Many individuals and businesses remained locked and government failed to provide necessary support facilities and other stimulus to accelerate the economic recovery similar to other governments (Saleh et al. 2018; Saleh et al. 2020a, b; Swekeh et al. 2021).

The impact of the pandemic was severe on the economy and constrained the country's economic growth. This has led loss of numerous works and raised the unemployment rate which was compounded by the decline in support received by the Palestinian National authority (PNA) from the donor agencies. Historical data proved that the donor support has fell from 32% of the country's GDP in 2008 to just 3.5% of the GDP in 2019. This coupled with harsh economic measures imposed on the country by Israel as well as consistent poor economic performance have resulted in a significant deterioration of socio-economic conditions in the Occupied Palestinian Territory (OPT) (Dawoud 2020). Several measures were employed to curtail the spread of the COVID-19 including the lockdown of all economic activities and other social engagements. The lockdown measure is adopted in early March and has led to some fiscal consequences more especially in OPT area. This has led to sudden drop down of revenue collection from trade, tourism, and transfers by PNA to its lowest position in the last 20 years (Ahmad and Zabadi 2020). Similarly, the Palestinian economy has been highly dependent on official and private transfers as means of foreign income generation, which was projected to continue declaim even aftermath of the COVID-19 pandemic. It was projected that the donor support will in fall to around $266 million in 2020 which was the lowest in the last decade. Various estimates on the cost of the pandemic point to an economic loss in the range of 7% to 35% of GDP, depending on forecast assumptions about the severity and duration of the pandemic.

On the other hand, the need of government expenditure has doubled as a result of the need for additional expenditure on health, social welfare, and other measure to cushion the effect of the pandemic on individuals and businesses. Yet, the PNA lacks a comprehensive economic policy and implementation tools to respond to the various challenge posed to it by the COVID-19 pandemic. It has no access to external

borrowing, no national currency, no independent monetary policy and no fiscal space (Dawoud 2020).

Regarding to the education in Palestine, number of educational institutions were closed to curtail the further spread of the virus and respect the sanctity of human life. During this period, students were asked to remain indoors to avoid social interaction which was believed to be the major means of transferring the virus from one person to another. This has made more than 1.43 million children to across the OPT to seek for e-learning facilities to further their education and receive age-appropriate, awareness-raising messages around COVID-19 (Hejaz 2020). Therefore, the government should have intervened immediately and found the most appropriate way to keep the educational process at a minimum.

Higher education institutions and educators have been forced to shift to online teaching through e-learning systems. Here continue and say that the government is poor and don't support too much the university. Therefore, the universities depend on their self to buy software and to enhance the e-learning infrastructure. The major challenge to e-learning in the country includes infrastructural deficit, poor electricity supply, weak internet services, and of proper awareness programs to stakeholders on the importance of e-learning. In addition, there are still confusion and problems with schools, as the financial situation in Palestine is bad, and teachers are still not receiving their full financial rights, as teachers now earn half of their salary, which is not enough to motivate them to do their duties.

5.4 The Case of United State of America

In the U.S.A, the federal government through the Coronavirus Aid, Relief, and Economic Security Act, (CARES Act), HR 748 has rollout the sum of $2.3 trillion to businesses and individuals to serve as economic stimulus, which is rated as biggest economic stimulus in the world in addressing the economic effect of COVID-19 pandemic. In addition, the Coronavirus Aid, Relief, and Economic Security (CARES) Act make a provision of $2 trillion as distress aid to individuals and businesses. These include direct payments, loans, and insurance benefits as palliatives with a view to mitigate the negative economic consequences of COVID-19 pandemic. In addition, president signed the Health Care Enhancement Act legislation and the Pay check Protection Program (PPP) which provide for $400 billion as additional funding for PPP, incentives to healthcare service providers and also for the supply of COVID-19 testing facilities. All these are equally regarded as tax exempt transactions.

In the United States, all the stakeholders in education were equipped with necessary resources that empower students to continue pursuing their education through online classes. The Centre for Disease Control and Prevention (CDC) provides guidance on how such activities should be conducted. The facilities provided by relevant government bodies to ensure that learning continues in the United States during the

pandemic period. This include *Kids' Zone* developed and managed by the Department of Education National Centre for Education Statistics, *Presentations and Activities to Help Students Learn about History* developed and managed by the Library of Congress, *Learn about careers in STEM fields* developed and managed by the Department of Defence among others. In addition, the government through Coronavirus Aid, Relief, and Economic Security Act authorized the secretary of education to provide substantial relief to children, families, educators, and service providers who have been profoundly affected by the pandemic. This is to allow these categories of students to continue their learning without being hindered by the economic turbulence caused by the pandemic.

5.5 The Case of Germany

Since the outbreak of the pandemic, the German government have responded to economic challenges through tax-related liquidity assistance, protective shield and provision of more flexible compensation benefit. The government stated that companies that suffered financial difficulties as a result of the pandemic should not be file for insolvency provided that those companies have some viable prospect in the near future. The government provides hundred billion Euro (€1billion) to cushion the effect of the COVID-19 pandemic and serve as measure to improve the financial position of corporate organization (Jochimsen 2020). In addition, the country provides additional four hundred billion Euro (€ 400 billion) to support companies that engaged in financial contractual agreements to meet their terms and remove their liquidity bottlenecks. Similarly, all consumer loan agreements that were signed before March 15, 2020, as well as other claims for repayment, amortization and interest, which are due between 1 April and June 30, 2020, are postponed by 3 months. This is based on the fact that the consumer must provide evidence of decline in income as a result of the outbreak of COVID-19 pandemic which makes the fulfillment of the obligation unattainable by the debtor more especially when his means of livelihood is largely affected by the pandemic.

In an effort to curtail the spread of the COVID-19 pandemic in Germany, tertiary institutions were instructed to switch their engagements to online classes. Although many students have already returned home to their families, travel restrictions and border controls have impacted a majority of international students by deeming them unable to return either to their home country or in Germany. To ease the suffering caused by the outbreak of the pandemic in Germany, on May 6, 2020, the government has announced grants of one hundred million Euro and many other loans to support students from the sufferings and other financial difficulties caused by the pandemic. This includes among others, interest free loan of up to six hundred Euros per month to students through the state-owned development bank Kreditanstalt für Wiederaufbau. The ministry of education will also provide students with acute emergency with non-repayable grant. These measures were put in place to mitigate the possibility of school dropout most especially the international students.

5.6 Conclusion

Based on the above discussion, it was observed that most of the developed nations have rolled out major policies to mitigate the negative consequences of COVID-19 pandemic in their countries. The objectives of the policies were to reduce the burden of the hardship of residents during the lock down period, support companies to meet their financial obligations, and stimulate the economic recoveries. With respect to educational activities, most of the developed nation has encountered little or no challenge in transition to online classes. This is because most of their educational institutions have adequate IT infrastructure and already leveraging the face-to-face activities with virtual teaching.

For developing countries, although, governments have made a significant effort to support both individuals and businesses, the levels of palliatives are grossly inadequate. Many individuals and businesses have suffered substantial losses and do not have access to government support programs. With respect to education, learning activities have suffered a great set back. This is because, the pandemic has crippled down the educational activities in these countries. The major challenges experienced in these countries include lack of good internet facilities and poor electricity supply, which make it difficult for students to advance their learning activities from the comfort of their homes.

The disparity in responding to issues presented by COVID-19 pandemic between developed and developing countries was a result of the level of economic and infrastructural development. Most of the developed nations have huge reserve and higher credit rating, which make it possible for them to provide enough support to their citizens. However, the situation is not the same in most of the developing nations. In countries like Palestine, for example, the government has been facing number of economic issues even before the outbreak of the pandemic. The COVID-19 pandemic has posed additional burden to these countries. That is to say, the pandemic has significantly reduced the government revenue and in the same time requesting more expenditure to support the citizens and stimulate economic recovery. Therefore, it is important for government more especially in developing nations to provide the citizens with necessary supports to ease their suffering more especially at this critical time. On the other hand, the citizens in the developing nations must not expect economic supports similar to those available in developed nations because of the differences in economic development.

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Chapter 6
The Influence of the Ownership Structure and the Corporate Governance Procedures on the Capital Structure of the Tunisian Insurance Enterprises

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Abstract This article studies the influence of corporate governance and ownership structure on capital structure of Tunisian insurance enterprises. Then, we utilize a sample composed of 22 Tunisian insurance enterprises during the period of study from 2000 to 2019. From the empirical results, we show that the improvement in governance did not affect the financing policy. The indicator which measures the size of the board of directors is negatively associated with the indicator which measures leverage ratio and the growth of independent members has more influence on the debt policy. The ROE-dividend payout rate differential has a negative nexus with the capital structure but is not influential enough. In fact, the self-financing policies adopted slightly affect the leverage ratio. Finally, the ownership structure characterized by the managerial shareholders and the institutional investors can be considered as a determining factor of the capital structure. In Tunisian insurance companies, the ownership structure influences the capital structure more than corporate governance.

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6.1 Introduction

The corporate governance is founded on the values of investor and donor confidence. It needs clarity and careful control and supervision. The corporate governance might impact planned judgments, particularly those concerning to funding and financing (Quang and Xin 2015; Boateng et al. 2017; Siromi and Cbandrapala 2017; Ahmad et al. 2018; Al-Saidi 2020; Derbali 2021). Wirtz (2006) points out that from an effectiveness viewpoint, the central issue of the corporate governance procedures is their impact on value creation.

Certainly, the corporate governance procedures incorporate numerous financial and non-financial components such as debt strategy (Piot and Missonier-Piera 2007), the ownership composition (Cho and Kim 2007), the organizational ownership (Zerni et al. 2009), and the board of executives (directors). Corresponding to the study of Florackis (2005), these procedures influence the performance of the firm. Also, they have a direct influence on the prosperity of investors and on the revenue of directors. The relationship among financial strategies and the excellent governance should take the lead to an optimum financial composition and the alleviation of disagreements of interest.

In the same context, La Porta et al. (2002) demonstrate that in countries with improve corporate governance requirements, and enterprises have a tendency to have elevated benefit. The corporate governance procedures such as the size and the composition of the board of executives (directors), the departure of decision-making and management functions have a direct influence on the financial composition. This effect has been examined in developed economies (Wen et al. 2000; Abor 2007). However, in developing economies these types of research are unusual. Corresponding to contemporary financial concepts, the agency costs have an influence on the financial composition of enterprises and the corporate governance facilitates assuage agency difficulties. Consequently, the corporate governance and the capital composition would be associated by their involvement with the agency costs.

Then, the purpose of our study is to investigate the links among the corporate governance procedures and the ownership composition on the one hand and the capital composition of the Tunisian insurance firms on the other hand. Then, we utilize a sample composed of 22 Tunisian insurance companies through the period of study from 2000 to 2019. Our empirical findings demonstrate that the improvement in governance did not influence the financing policy. The size of the board of directors is significantly and negatively associated with the leverage ratio, and the growth of independent members has more impact on the debt policy. The ROE-dividend payout rate differential has a negative connection with the capital structure but is not influential enough. Then, the ownership structure described by the managerial investors and institutional shareholders is a contributing factor of the capital composition. In Tunisian insurance companies, the ownership structure influences the capital structure more than governance.

Our article is structured as follow: Sect. 6.2 is devoted to expose the literature review. Section 6.3 is devoted to the evolution of corporate governance in Tunisia.

Section 6.4 gives the methodology and the econometric model to be applied. In Sect. 6.5, we present the empirical findings of used model specification. Finally, in Sect. 6.6, we conclude.

6.2   Literature Review

6.2.1   *The Ownership Structure and the Capital Structure*

Jensen and Meckling (1976) maintain that organizational participation in capital diminishes inducements to use gratuities and appropriate investors and promotes configuration of managerial and shareholder interests. It also helps reduce the risk of getting involved in the non-maximizing value behavior of the business. Additionally, Fama and Jensen (1983) maintain that this contribution can have harmful impacts by generating agency disputes, and it can improve administrative deviousness. Also, Jensen (1986) observes that a firm's managers may get attempts to grow the firm outside its ideal size to improve their personal profits. However, this strategy can have an advantage to an increase in debt. It can lead to the empowerment of administrators, nonetheless it will have a negative impact on the productivity and the performance of the firms.

Irwin and Lang (1988) demonstrate that there is a significant and negative connection among the financial leverage proportion and managerial contributing. Then, this suggests that in the nonappearance of a major outside shareholder, the debt ratio increases which would increase financial risk. In the same context, Berger et al. (1997) study the link among the excision of managers and the capital composition of firms. Their findings indicate that entrenched leaders are making efforts to avoid over-reliance on debt. Examining the evolution of debt levels reveals that leverage ratios increase when steps are taken to reduce entrenchment (such as replacing the CEO or certain board members).

Numerous investigations have analyzed the influence of the ownership structure on financial composition of firms in a number of countries. Then, their empirical findings demonstrate that there are significant and positive links among the ownership and the debt proportion while a negative link is noticed among the ownership of block owners of shares and this identical proportion. Several studies have shown that the relationship among organizational ownership and the debt proportion is not constantly meaningful in the existence of a large building block of outside investors.

Brailsford et al. (2002) discover that the organizational ownership and the leverage ratio can be related in a non-linear fashion. It offers proof of the presence of significant and negative nexus among the intensity of executive participation and the degree of equity. Brailsford et al. (2002) find that the minimal degree of organizational ownership precedes to a decrease in organization disagreements and an elevated degree of debt. Its empirical findings demonstrate that elevated degrees of management's

impart in capital raise organizational speculation and advantage to reduce amounts of debt.

6.2.2 The Nexus Among Board Size and Capital Structure

The board of executives is the greatest body accountable for the tactical managing of the enterprise and the extremely essential decisions. Then, Pfeffer and Salancick (1978) obtain a substantial correlation among capital structure and board size. Also, the board of directors might understand it challenging to achieve compromise when getting decisions which can influence the quality of the corporate governance. This condition would start to an expansion in financial debts.

Following to Jensen (1986), the companies with elevated debt tend to have larger boards of executives. Anderson et al. (2004) demonstrate that the cost of debt is shorter for firms with great boards because lenders believe that these firms are tightly controlled by a multidisciplinary team of experts.

6.2.3 Impact of the Presence of Independent Members on the Funding Policy

The autonomous executives are anticipated to compete a leading role in business management. The impact of their presence on the capital composition has been investigated by a few investigators with mixed results.

For Pfeffer and Salancick (1978), the role of independent directors in improving a company's ability to gain recognition from external stakeholders is essential. Their presence leads to the reduction of uncertainty about the business and improves the company's ability to monetize the funds. They found that the superior quantity of independent executives, the greater the degree of indebtedness. Jensen (1986) and Berger et al. (1997) notice that enterprises with boards of executives with a minimal representation of independent executives have smaller leverage ratios.

Lennox (2005) shows that independent external directors increase the usefulness of the control function devolved on the board of directors. Abor and Biekpe (2007) find an important and positive link among the debt levels and the board size and composition. They claimed that SMEs that have more independent directors with diverse skills have more equity.

Wen et al. (2000) demonstrate that the level of indebtedness and the presence of independent directors are negatively related. Indeed, these directors ensure that the directors do not resort to debts unless they bring additional profits.

6.2.4 Effects of the Separation Between the Chairmanship of the Board and General Management

In this case, the CEO is not the chairman of the board of directors. This position can have an immediate effect on the funding judgment. Fama and Jensen (1983) maintain that the functions of executing and controlling decisions should be divided. The executive role includes the appropriate to introduce and execute additional propositions relating to the financial resources of the company while the judgment control role includes the appropriate to authorize and scrutinize these suggestions. Then, this system simplifies the reasonable utilization of the company's funds.

The board of directors is the primary controller of decision-making in the corporate structure, and it should not be dominated by the CEO. Therefore, the management of decisions and the supervisory authority should be separated. Fosberg (2004) finds that companies that have opted for separation have an optimal volume of loans and their leverage ratios are high. In contrast, Abor and Biekpe (2007) show that the correlation among the degree of indebtedness and the accumulation between board chair and management is positive.

6.2.5 Impact of the ROE Differential—Dividend Distribution Rate on the Capital Structure

The difference (ROE-Dividend Payout Ratio) gives us an idea of the relative importance of self-financing. A good self-financing policy makes it possible to seize investment opportunities while ensuring a certain degree of financial autonomy. It increases the debt capacity of the company and should be important when recourse to credit is considered.

Most of the companies in the sample built up fairly large reserves annually. When the rates of return are high, the company can increase its effective self-financing thereby increasing its debt capacity. The increase in internal capital reduces the proportion of debt. In this case, the relationship between this differential and the leverage ratio is assumed to be negative.

6.3 Governance in Tunisia

6.3.1 The Governance System

In Tunisia, the corporate governance system is an intermediary system that combines aspects of the market-oriented system and those of the network-oriented system.

These aspects were studied by Charreaux (1997) who identified the main characteristics of the two systems according to the distinction between the preventive and curative role.

The majority of Tunisian private companies, even some that are listed, are managed by their founders who are the majority shareholders who refuse to associate with partners. Outside leaders occupy second-tier positions and are under the influence of the owners.

Ever since 1972, Tunisian regulators have encouraged investing in each activity sectors by enabling the awarding of credits of up to 80% of the price of any project. The shareholders rely further on loans than on equity. Also, numerous private enterprises are exemplified by cross-shareholdings. In this context, Classens et al. (2000) affirm that this form of ownership composition produces complete control of companies by investors. They have shown that mainstream investors have good control across enterprises.

Omri (2002) shows that the further the ownership is concentrated, the further executives are controlled, and further the firm is performing. Along with the nonexistence of an internal self-control body in personal companies, it is the managers themselves who control the use of judgments and activity.

The Code of Commercial Companies of 2000 and the Governance Law of 2005 impose mechanisms on Tunisian companies such as the board of directors, the supervisory board, the audit, the management board, and the statutory auditor. The law of 2005 added other mechanisms such as the separation between company management and the board chair, interim financial statements, and the internal audit committee.

The companies in the structure of a public restricted firm have the choice between two management methods, board of directors, and chairman and chief executive officer with the possibility of separation or supervisory board and management board composed of up to five people. But the majority have opted for the board mode with CEO.

6.3.2 The Governance Quality Index

If the index is high and it exceeds a certain threshold, governance is good. A low index means poor governance. In calculating this index, we give equal importance to all mechanisms, and we do not neglect any.

The governance index is a signal for potential investors. The governance law of 2005 imposes several governance mechanisms on listed companies and those preparing to enter the financial market. Each mechanism has a minimum and / or a maximum. The high level and the increase in the number of mechanisms are signs of good governance.

Based on the GIM index of Gompers et al. (2003), we calculated the indices of the companies in the sample, during the period 2000–2011. This index is equal to the sum of the logarithms of the 14 governance mechanisms provided for by law. The change in the index from 2006 is related to the new regulations and is explained by:

– The introduction of new mechanisms in several unlisted companies.
– Increasing the level of certain mechanisms in all private sector companies.
– The modification of the ownership structure of certain companies following the introduction of foreign participation in their capital.

The growth in the total of mechanisms is targeted at preparing for the IPO. This increase as well as the appointment of new external directors should influence the financial strategies of companies. Did this improvement in governance has an impact on the capital composition in the Tunisian insurance companies?

6.4   Econometric Methodology

Our paper analyzes the link among the capital composition and governance of non-financial enterprises in Tunisia before the promulgation of the governance law (2000–2005) and after (2006–2019). The sample is made up of 22 Tunisian insurance companies. The accounting data is used for the regressions. Thus, the distinction between these two categories of business is not helpful.

The dataset was obtained from the financial reports of the selected firms. The data concerning to governance mechanisms were collected by questionnaire. The list of Tunisian insurance enterprises employed in our paper are summarized in Table 6.1.

6.4.1   Model Specification

The general shape of the model is as follows:

$$Y_{it} = \alpha + \beta\, X_{it} + \gamma\, Y_{it-1} + \varepsilon_{it} \tag{6.1}$$

where Y_{it} presents the leverage ratio of insurance company i at the ending of the period t, X_{it} measures the ownership structure indicators and values of the governance mechanisms of enterprise i at the ending of the period t and ε_{it} measures the Error term.

The model specification is presented as follow:

$$\begin{aligned}
RALEV_{it} = {} & \alpha + \gamma_1 * RALEV_{it-1} + \gamma_2 * (ROE - TDD_{it-1}) \\
& + \beta_1 * \log(TCONS_{it}) + \beta_2 * SEP_{it} + \beta_3 * MEIND_{it} \\
& + \beta_4 * INSTACT_{it} + \beta_5 * ACTMAN_{it} + \varepsilon_{it}
\end{aligned} \tag{6.2}$$

where $RALEV_{it}$ present the Leverage ratio, $\log(TCONSit)$ measures the size of board of executives, SEP_{it} measures the Separation between Chairman of Board and Director, $MEMIND_{it}$ measures the number of independent board members, $INSTACT_{it}$ measures the Institutional shareholders, $ACTMAN_{it}$ measures the

Table 6.1 The list of Tunisian insurance enterprises

Number	Company name	Number	Company name
1	A M I ASSURANCES	12	GAT VIE
2	ASSURANCES BIAT	13	GROUPE CTAMA
3	ASTREE	14	HAYETT
4	AT-TAKAFULIA	15	LLOYD TUNISIEN
5	ATTIJARI ASSURANCE	16	M A E
6	CARTE ASSURANCES	17	MAGHREBIA
7	CARTE VIE	18	MAGHREBIA VIE
8	COMAR	19	BH Assurance
9	COTUNACE	20	STAR
10	EL AMANA TAKAFUL	21	TUNIS RE
11	G A T ASSURANCES	22	ZITOUNA TAKAFUL

Source Elaborated by the authors

managerial shareholding, (ROE_{it-1}-TDD_{it-1}) measures the Difference between ROE and dividend payout rate, SEP_{it} measures the Separation among the chairman of Board and the Chief Executive Officer, ε_{it} residual term, i indicates the insurance company, and t indicates the year (2000–2019).

6.4.2 The Variable Definitions

6.4.2.1 The Dependent Variable: Leverage Ratio

The capital composition is represented by the book value of the ratio (the total debt/the equity). Book value was preferred because the optimum degree of debt is revealed by the trade-off among the profits and expenses of borrowing. It is a well-founded statement that the main profit of leverage is the additional profit and tax savings. Their values were always accountable. Since the leverage ratio can be calculated either with total debts or long-term debts only, total debts are retained in the model due to the relative importance of short-term debts and their systematic renewal. The carrying values are used because the sample is made up of listed and unlisted insurance companies.

6.4.2.2   The Independent Indicators

The Leverage Ratio of the Previous Period

The leverage ratio varies continuously due to variability in equity and debt. For profitable companies, equity increases annually following the constitution of reserves. In private and family-run companies, executive shareholders pay themselves very high salaries and considerable benefits in kind to the point where they no longer seek dividends. A percentage of the profits is reinvested each year. The permanent recourse of Tunisian insurance companies to short-term bank debts to finance their operating cycles affects the leverage ratio.

The ROE-Dividend Payout Rate Differential

This differential represents the self-financing policy. The larger it is, the lower the leverage ratio. Its integration into the model makes it possible to bring the coefficients of the governance and property structure variables back to their effective levels and to highlight their real effects.

Board Size

Through its strategic choices and its strict management control, the Board of Executives is the main guarantor of excellent governance. Its strategic choices have an effect on the capital composition of insurance enterprises. The size of the board is assessed by the logarithm of the total of its memberships. It is negatively correlated with the leverage ratio.

The Composition of the Board

The presence of external memberships who have no ties to the insurance company means that the company is tightly controlled and that its decisions are not influenced by management and majority shareholders. It increases the confidence of donors. Beasley and Petroni (2001) see that independent board members require that financial statements be certified by independent, reputable external auditors who are not chosen by management. This indicator is calculated by the proportion of individual members.

The Separation Between the Presidency and the General Management

If a manager combines general management and board chairmanship, agency problems can arise in the insurance company. The fact that a leader controls his own management style can lead him to behave opportunistically, leading to a decrease in

the level of debt under the assumption of entrenchment. The separation is believed to be negatively associated to the degree of indebtedness. It is measured by a dummy variable which is equivalent to 1 if the president is at the same time CEO, 0 otherwise.

Institutional Shareholders

The presence of institutional shareholders is supposed to improve the control of strategic financial policies and help to obtain long-term loans at an advantageous cost. The debt ratio can increase. Kane and Velury (2004) see that institutional shareholders can become influential thus ensuring rigorous control of managerial actions by requiring a good quality and independent external audit. Institutional participation is calculated by the proportion of shares taken by insurance companies and financial societies.

Managerial Shareholding

This variable is measured by the percentage of shares taken by executives and participants of the board of executives. Excessive indebtedness that exceeds the repayment capacity improves the risk of bankruptcy. In this case, it is the managers who would bear the consequences. They may need to decrease the level of indebtedness. This means that the link among the leverage ratio and the level of managerial shareholding is significant and negative.

6.4.3 Descriptive Statistics

Table 6.2 illustrates that the average board size is 5.21 with an observed maximum of 12 participants and a minimum size of 2 (this is the legal minimum). Independent directors make up an average of 31% of boards. This rate of representation is

Table 6.2 Descriptive statistics

Indicators	Mean	Std. div	Minimum	Maximim
RALEV	1.70	2.86	0.419	3.6
$RALEV_{t-1}$	1.54	2.91	0.418	2.9
TCONS	5.21	5.72	2	12
MEIND	0.32	−1.16	0	2
INSTACT	0.24	1.26	0	1
MANACT	0.38	1.41	0	0.69
$(ROE-TDD)_{t-1}$	0.368	0.64	0.127	0.47

Source Elaborated by the authors

Table 6.3   Unconditional correlation matrix

	RALEV	RALEV$_{t-1}$	TCONS	MEIND	INSTACT	MANACT	(ROE-TDD)$_{t-1}$
RALEV	1.00						
RALEV$_{t-1}$	0.762	1.00					
TCONS	0.708	0.292	1.00				
MEIND	0.537	0.209	0.134	1.00			
INSTACT	−0.096	−0.386	−0.427	−0.019	1.00		
MANACT	0.353	0.369	0.012	−0.295	−0.374	1.00	
(ROE-TDD)$_{t-1}$	0.093	0.123	0.158	0.092	−0.036	0.124	1.00

Source Elaborated by the authors

explained by the high number of independent members in certain listed companies with large boards.

Institutional shareholding is 23% on average. The presence of institutional investors is relatively high due to the participation of SICARs in the capital of insurance companies. The average leverage ratio is 1.7 which is a reasonable mix of funds.

Table 6.3 gives a leverage ratio that is positively and strongly associated with the ratio of the previous period. The ROE-Dividend Payout Rate differential is negatively associated with the debt proportion. This outcome is reliable with the theory of hierarchical financing since companies finance new projects from their internal funds before resorting to debt.

In application of prudential rules, Tunisian banks require 31% self-financing for the granting of medium and long-term credits guaranteed by assets, because they never assume an increasing risk for the same assets.

The correlation matrix suggests that organizational shareholding is negatively associated with the leverage percentage. This finding is reliable with more investigations that claim that when managerial ownership improves, leaders tend to decrease debt to reduce their own risk. Institutional shareholding is positively connected with capital composition. This result is explained by the effective control carried out by the institutions.

The size of the board of executives is negatively related with the leverage proportion. Big boards can put pressure on leaders to maintain an acceptable level of debt. Another characteristic of this examination is that enterprises that have great advice have more resources and collateral. They can therefore contract debts under more favorable conditions of rate, duration, and method of repayment.

The link among the variable "number of independent memberships" and managerial shareholding is negative, which means that the increase in the ownership of managers leads to a reduction in the level of autonomy of the board of executives. This means that owner-managers do not accept independent members on their boards.

Both the power of a board by close relatives and the lack of a sufficient quantity of individual members are a practice which affects the performance of the insurance company. They are contrary to the spirit of good corporate governance.

6.5 Results

The analysis of two regressions shows that the leverage ratio of the previous year is the most influential variable, which means that the financing policy, and by the same the capital structure evolves slowly and this, whatever the changes observed in the ownership structure and the degree of improvement in governance. Leaders do not quickly change their fundraising habits because they are committed to the medium to long term. Even following the establishment of several governance structures, the coefficient of the leverage ratio variable was still the highest. Tables 6.4 and 6.5 recapitulate the estimation of used specification model for the two periods specified in our paper. From these tables, we demonstrate that the estimate coefficients of determination for the estimate model are superior to 0.6, hence, the 2 estimates are illustrated by a great linear fit.

In addition, a 1% raise in the ROE-TDD differential indicates to a reduction in the leverage ratio of 1.16%. This relationship is considerable at the 0.05 degree. Then, this finding is reliable with the hierarchical financing theory which assumes that in profitable insurance companies, internal equity constitutes the primary mode of financing growth.

The results demonstrate the presence of a significant negative connection among the size of the board of executives and the debt ratio. After the enactment of the new governance law, the size effect increased. This result confirms those of Berger et al. (1997) and Abor (2007) who maintain that large councils choose short quantities of debt. Big boards can put pressure on owners and managers by demanding additional impartiality in request to increase the financial strength of business and reduce its risks.

The existence of autonomous executives has no significant influence on indebtedness and does not improve the process of strategic decision-making. 8 insurance

Table 6.4 The results for the first period 2000–2005

Variables	Coefficients	Std. div	t-statistics	P-value
Constant	0.82	0.181	1.86	0.00
RALEV$_{t-1}$	2.47**	1.171	0.74	0.12
TCONS	−1.10**	0.206	−1.64	0.07
MEIND	0.24*	0.165	0.52	0.49
INSTACT	0.51**	0.286	1.13	0.41
MANACT	−0.78**	0.153	−1.58	0.03
SEP	0.19*	0.674	0.73	0.49
(ROE-TDD)$_{t-1}$	−1.72**	0.369	−1.93	0.00
$R^2 = 0.616$				

Note 1%, 5%, and 10% represent the statistical significance at a level presented by (*), (**), and (***), respectively
Source Own Elaboration

Table 6.5 The results for the first period 2006–2019

Variables	Coefficients	Std. div	t-statistics	P-value
Constante	0.85	0.190	3.33	0.00
$RALEV_{t-1}$	2.62**	1.232	0.76	0.10
TCONS	−1.42**	0.146	−1.88	0.06
MEIND	0.52*	0.155	0.43	0.48
INSTACT	0.34**	0.466	1.52	0.38
MANACT	−0.81**	0.385	−1.93	0.03
SEP	0.43**	0.764	0.85	0.64
$(ROE\text{-}TDD)_{t-1}$	−1.26*	0.552	−3.04	0.00
$R^2 = 0.635$				

Note 1%, 5%, and 10% represent the statistical significance at a level presented by (*), (**), and (***), respectively
Source Own Elaboration

companies in the sample (36.4%) have only one or two independent members. These members are not so influential in modifying the decisions of the leaders, and their presence has no impact on the debt policy.

Managerial ownership significantly affects the structure of capital. For the phase from 2006 to 2019, an expansion in the share of executives in the capital of 1% leads to a decrease in the debt ratio equal to 0.82%. To avoid any threat to the lengthy-term feasibility of the insurance company, management adopts a reasonable debt policy. These results confirm to the study of Irwin and Lang (1988) who maintain that in the non-existence of any significant outside participation, the tendency to have a low debt proportion will persevere, preventing shareholder managers from increasing risk.

In addition, a considerably negative link is observed among the presence of institutional investors and the leverage ratio. For Tunisian insurance companies, financial debts are not the source of conflicts among managers and shareholders. But rather among majority shareholders and smaller investors.

6.6 Conclusion

The study found that despite the improvement in the governance index, the leverage ratio remains high. A well-governed business benefits from leverage. We investigate the influence of the corporate governance and the ownership composition on the capital structure of Tunisian insurance enterprises. Then, we employ a sample composed of 22 Tunisian insurance enterprises during the period of study from 2000 to 2019. The results of the two regressions show that board size is negatively and considerably associated to capital structure. Additionally, the high number of independent members of the board of executives affects the capital structure by reducing debts.

The presence of institutional shareholders limits unnecessary recourse to borrowing. As for the separation between the chairmanship of the board and the management, it has no considerable association with the capital composition.

In Tunisian companies, the executive ownership has a considerable and negative connection along with the debt ratio suggesting that the increase in the share of managers prompts them to reduce debt levels. But institutional ownership is considerably and negatively linked to the leverage ratio. Also, the spread between the ROE and the dividend payout rate has an important and negative link with the leverage proportion.

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Part III
Artificial Intelligence and the Future of Accountancy

Chapter 7
An Investigation of Artificial Intelligence Application in Auditing

Tamanna Abdul Rahman Dalwai, Araby Madbouly, and Syeeda Shafiya Mohammadi

Abstract The auditing profession is changing due to the advent and enforcement of artificial intelligence (AI) in its field. The implementation of artificial intelligence is introducing the advantages of taking over manual processes and promoting effective value-added decision making by the auditors. This chapter discusses the development and use of artificial intelligence in auditing from the prospects of education, profession, and ethical implications. It is not sufficient for the auditors to have professional knowledge only but to also develop the acumen for the implementation of artificial intelligence. Undergraduate and postgraduate degrees are being revamped to include knowledge of AI. Additionally, auditors are catching up on AI developments through professional development courses. The audit process benefits from AI due to the coverage of all the transactions instead of relying only on a sample to make a judgment. Auditing firms are investing in contract analysis software to go through complex documents. However, the ethical implications of AI are new and regulatory authorities are still in the process of providing adequate coverage toward the use of AI. The bottom-line of implementing AI processes is that it is complementary to the function of auditing and not a replacement.

Keywords Artificial intelligence · Auditing · Education · Ethics

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7.1   Introduction

The role of an auditor and audit process is evolving through breakthrough innovation in artificial intelligence (AI), big data, data analytics, and workflow automation. These developments are eliminating tedious and labor-intensive manual process in audit, and enabling auditors to powerful insights. The innovative technologies are supporting in enhancing audit quality for the various stakeholders which involve the clients, auditors, investors, and capital markets (Raphael 2017). Tiberius and Hirth (2019) surveyed German auditing professionals for the expected auditing practices in the wake of technological developments. This study concluded that new technologies would not replace auditors but would provide relief and support in the auditing process. Additionally, the annual audit was expected to revolve around a continuous audit approach.

Artificial Intelligence (AI) is characterized as digital intelligence or intelligence of the technological advances, which resembles intellectual functions. It encompasses a range of interlinked innovations including data processing, deep learning, voice recognition, image recognition, and an interpretation of emotions. AI consists of two components i.e., Artificial and Intelligence. Artificial that is formed by humans and intelligence is the ability to interpret, motives etc. The behavior of AI can be coded as an automated system that enables a user to replicate, create, or illustrate human consciousness.

The accelerated digitalization is posing significant challenges to every industry and auditing firms are expected to also experience an impact. In the wake of these challenges, firms would have to use their foresight to enable early warnings, improve long-term planning, innovation process and decision making, and be agile to environmental changes (Iden et al. 2017). The firms also need to think ahead in developing competitive advantage (Anderson 1997) and overall profitability (Rohrbeck and Kum 2018; Alareeni 2019a; Alsuwaigh et al. 2020; Alzaneen and Mahmoud 2019) by forecasting the impact of digitization in auditing (Alareeni 2019b).

Machine learning, which is a key subset of AI, has demonstrated a significant impact on the way audits are performed. Auditors are able to avoid the tradeoff between speed and quality with the implementation of machine learning in the profession (Raphael 2017). While new advancement in technology has had an immediate impact on the elimination of manual and routine tasks, there is still a little appetite for a human free audit. Automation in audit supports in reducing errors and spotting patterns, thereby the role of an auditor as an independent challenging voice with skills of communication, empathy, and persuasion continue to remain secure (McGhee and Grant 2019).

Figure 7.1 describes the advantages artificial intelligence has brought to the auditing field. It is crucial to note that mundane and repetitive tasks are managed by the AI systems whereas the accountants and auditors can focus more on the core business and decision-making. AI has changed the focus of these professionals to an interpretive mode thereby requiring a new set of skills that can harness the benefits brought about by the new technology.
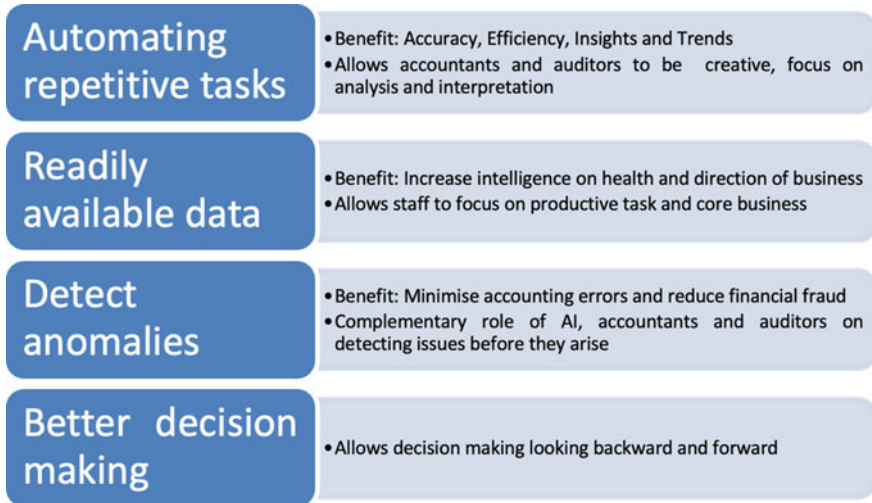
Fig. 7.1 Role of artificial intelligence in accounting and auditing. *Source* Interpretation from Govil (2020)

This chapter aims to provide an insight into the impact of artificial intelligence on auditing education and profession. It also investigates the ethical implications and risks associated with AI before implementation into the auditing profession. To address these objectives, this chapter provides a detailed literature review on AI aspects already established for the auditing field.

This chapter is organized to discuss the impact of artificial intelligence on auditing education. This is followed by an insight into how artificial intelligence is having an impact on the auditing profession. Section 7.2.3 discusses the ethical implications of artificial intelligence on auditing. Section 7.2.4 presents the risks related to artificial intelligence. The final chapter provides the overall conclusion in terms of the findings made from the literature review and the progress of AI in auditing.

7.2 Literature Review

7.2.1 Artificial Intelligence and Auditing Education

The field of Artificial Intelligence in Education (AIED) is innovative and derivative. It contains related methodological approaches such as AI, cognitive science, and education. AIED essentially comprises of two main complementary elements: the development of AI-based learning tools and their use to understand learning. AI is rising rapidly in the educational sense that is expected to become a market value of approximately 6 billion dollars by the year 2024 (Bhutani and Wadhwani 2020).

In particular, students primarily focus on accounting courses, to develop their knowledge and skills in accounting, auditing, and technology. Preparedness and acceptance by students in emerging technology disciplines are thus primarily influenced by the effectiveness of accounting curricula in providing educational skills in these areas. While ongoing development and application of cognitive machine technology are unavoidable in accounting and auditing, academic research is inadequate that examines the impact of AI on higher education in accounting and the future of accounting technology (Siau 2017). On the other hand, numerous researches have investigated the AI effect on accounting and auditing (Kokina and Davenport 2017).

An efficient expert system provides numerous benefits when applied to audit, including the automatic understanding of audit task operations and increased transferability of knowledge (Omoteso 2012; Lombardi and Dull 2016). Universities and colleges must establish strong relationships with professionals in the field so that students can access valuable opportunities (Maginnis and Wagaman 2019). Improving education in accounting and auditing is important to give students with a better possible understanding of job opportunities and gain experiences.

Based on emerging technologies, such as artificial intelligence, the accountants will continue to succeed and develop through more specialized consulting services and helps client integration with Artificial Intelligence and customer awareness instead of being solely concentrated on measuring financial data (Ovaska-Few 2017). Training and retraining are required in some cases.

A financial audit involves stressful, labor-intensive analysis into the financial statements and its business. The audit objective is to gather evidence that allows the auditor to express an opinion as to whether, in all significant respects, the financial statements represent the company appropriately. Throughout the audit process, the use of AI technology strengthens the audit profession but does not replace it. AI increases the efficiency, efficacy, and accuracy of audits. The experts in accounting and auditing will study and be thought leaders, transferring specialized expertise to senior management. Furthermore, ensure that businesses embrace AI, that offers the best customer services to clients.

AI's assistance in research and testing provides auditors with more time to analyze the factors behind AI's trends and anomalies. AI will accomplish various repetitive tasks and make the auditors act as an advisor, thereby improving efficiency and confidence in the audit, while simultaneously reducing risks. Auditors must remain active and efficient to plan for the deep implementation of AI. The auditor now is expected to have the characteristics of being tech-savvy, strategic thinker, and a good communicator. While deep knowledge and know-how in traditional audit areas will continue to be required even with AI, auditors must be responsive to their changing climate. It is advisable for students who want a position in this field to educate by incorporating technology and research as an ideal candidate in addition to their accounting basis. The field of an audit is evolving rapidly because of AI growth.

Auditors will have to re-focus on the technology associated with AI acquiring the skills related to higher-value tasks involving intuitions, decisions, communication skills expertise. Murphy (2017) advocated the need for such competencies as it encourages companies to develop organization environment which is coupled with

intensive training. ACCA research presents insights into future skills and how they can change, and the requirement of "digital quotient" (McGhee and Grant 2019).

The report by McGhee and Grant (2019) also identified the most important competency area and mentioned that there is a large gap of skills in all specialized futuristic finance professions including the traditional technical skills and range of quotients such as Intelligence (IQ), Digital (DQ), Vision (VQ), Experience (XQ), Technical skills and ethics (TEQ). ACCA and CA ANZ provide education and knowledge-building skills to improve the technical and technological capability of students and the members. It also ascertains financial and non-financial information that recognizes the professional and ethical requirements that must be met through the use of data technologies. Forbes and KPMG (2017) articulated that in order to attract the interest and thoughts of young individuals, accounting needs to be seen as forward-looking, innovative, and high-tech. The "hybrid skills" required for potential auditors, on the other hand, can make the audit profession more appealing for people from various backgrounds. Auditing is still a profession that requires teamwork, and it is important to combine the right skills in the team.

7.2.2 Artificial Intelligence and Auditing Profession

AI is a concept with interlinked technologies that involve data mining, machine learning, speech recognition, image recognition and sentiment analysis. For the auditing profession, artificial intelligence provides the benefits of advanced methods that support in understanding ledgers, detecting material misstatements, and reporting the underlying risks to the clients (Colthart 2019). Both the auditing firm and client will find its amount of work considerably reduced due to AI-based systems as it analyzes complete ledgers with minimum questioning of the client. AI parses information that will flag transactions that deviate from the data set which would not be caught by traditional testing practices (Colthart 2019).

With the proliferation of financial transactions, auditors must decide on the sample that is representative of the population. This would enable them to make conclusions that are generalizable beyond the sample. This is where machine learning steps in and resolves the dilemma of sampling as it reviews the entire population and provides assistance to the auditor for testing the items that are beyond the norm (ACCA 2019). PwC (2017) discusses an example of machine learning in audit at a US firm according to which, the machine searches for the peer group of Company A which is being audited. A set of peer group ratios are calculated and compared against Company A performance to identify unusual trends. This data are then shared with the auditors to investigate if the variance is an anomaly and the reasons for the same. The auditor's decision and reason are then fed into the machine for responding to similar variances in future. Thereby, machines would identify unusual patterns instantly and support auditors in detecting fraud. Another practical example of the deployment of machine learning is the tie-up of Deloitte with Kira Systems in 2014 whereby a contract analysis software was introduced (Kepes 2016). The platform was trained to read

complex documents, extract and structure textual information for analysis. Boillet (2018a) also advocates that AI tools are able to accurately extract information from lease contracts based on pre-defined criteria thereby improving the precision over human review. This enables value addition to the audit process as better queries and interaction can be established with the CFOs, audit committees and board of directors.

Taylor (2020) suggests that sentiment analysis is a popular tool that scans and processes employee sentiment by evaluating pieces of text. This would identify if the tone of the employee was positive, negative, or neutral with reference to the topic and be the potential to mitigate future risks and combat fraud. The intelligent communications monitoring are built with bankruptcy prediction algorithm that analysis the employee textual communication along with the financial statements calculations. This supports scanning early indicators for any financial problems and mitigating its associated risks.

Artificial intelligence use in analyzing the audit proposals through the use of Coh-Metrix Text Principal Component scores has supported in identifying strategies to be adopted for communication by the auditing firms (Chang and Stone 2019). Auditing firms market their services through well-drafted auditing proposals, thereby attracting potential clients. The audit proposal quality will result in competition intensification to obtain audit engagements (Broberg et al. 2013) and establish unique selling points for differentiating themselves (Hodges and Young 2009). Auditors are guided for improving their written communication materials in terms of clarity, conciseness, simplicity, consistency, and coherence through the use of linguistic-based studies (Fakhfakh 2015). Chang and Stone (2019) advocate that training auditors based on linguistic methods and tools would improve their overall communication success as a firm. Thereby auditing firms can use the Coh-Metrix tools to identify the textual features needing improvement in the audit proposals or audit reports and serve for its larger communication and marketing purpose.

7.2.3 Artificial Intelligence and Ethical Implications in Auditing

(a)   Ethics and AI

There are two common types of ethics, they are "instance-based ethics" and "principle-based ethics." The former is related to the observation of any matter and note that there is something wrong, while the latter is "related to the application of values consistently to reach appropriate decisions, regardless of the particulars of the situation." Principle-based ethics are more related to AI which needs it needs designed ethics to control all related issues (Chartered Institute of Internal Auditors

2019). The ethical study of AI, as a part of emerging technologies, is considered still in its early stages. The importance of emerging technologies and the need to have ethical analysis related to it has been realized recently, then the need to have theories and methodologies to deal with it is still novel (Brey 2012).

(b)   Futuristic approach and AI

The deal with ethics within the emerging technologies, and consequently AI, can be proceeded through one of three approaches. First: ignorance, under the belief of keep innovation and do not stifle it. This approach is not practical as it would only lead to deferring problems. Second: conservative approach, according to it, ethical issues will be addressed only when they materialize or when they are reliably predictable. This approach would also not practical for AI as its more dynamic and its' adaption is proceeded at a pace faster than other types of technology and its' related issues are more complicated and unfeasible to change when the technology being in use (Munoko et al. 2020). The concerns about the two approaches support the third approach which called "futuristic approach." This approach aims to forecast what the ethical implications will be of using emerging technology in the particular field of auditing (Brey 2012). The ethical analysis of emerging technology implicitly contains uncertainty related to many perspectives such as future devices and applications (Sollie 2007). The question is when there is no certainty about future technologies, how the ethical analysis be done? The deal with this problem can be done through one of two approaches, the first is more conservative and reliable while the second is more uncertain and speculative.

The first approach is called "generic approach," it focusses only on ethical issues that can be predicted reliably or fully known. These issues are predicted to appear with any future use of technology, and they are unavoidable. These issues are related to the characteristics of the technology itself or characteristics related to possible applications. The development of genetic technology was correlated from the beginning with the need of having modification of genetic material. Hence, this approach deals with these generic ethical issues expected from the technology progresses. The second approach is more speculative, and it's called "the forecasting approach." This approach predicts different devices and implications the emerging technology (including AI). It explores ethical issues that would present themselves if these forecasts were to come true (Brey 2012).

(c)   Ethical approaches to AI

Although many forecasting approaches to technology are followed, ethical approaches to technology that involve forecasting are only a few, these approaches developed only during the last decade. These approaches are: (i) ethical technology assessment (eTA), (ii) ethical impact assessment approach, (iii) the techno-ethical scenarios approach, and (iv) ethical assessment of emerging information and communication technologies (ETICA).

Ethical Technology Assessment (ETA) approach has elaborated by Palm and Hansson (2006). Technology developers participated significantly in the development of this approach. It assesses practices and provides negative ethical implications related to the development of technology (Palm and Hansson 2006). ETA takes place via indicating ethical concepts in technology-related matters which are even projected features of technology or/and anticipated social consequences of technology usage through. It relies on an ethical checklist includes nine issues related directly or indirectly to the ethical emerging technologies even in a conventional sense or in a broad sense. This approach may indicate that this approach is more suitable to assess the ethical issues related to the technology in the long-run only, while in the long-run (Brey 2012).

Wright (2011) initiated the second approach which is called the "Ethical Impact Assessment Approach" (EIAA) to ensure that ethical issues are taken into consideration when IT developers develop any new technology-related initiative. Wright's approach ensures ethical IT issues via an extended checklist contains a wide range of ethical values and principles. The answer to these questions was collected from all stakeholders through many platforms, such as expert workshops, consultations, and surveys. Wright's approach is more suited for the ethical assessment of the already existing and known IT projects rather than the broad ethical assessment of emerging IT and its' related uncertainty issues.

A third recent approach is called "Techno-Ethical Scenarios Approach" (TESA) elaborated by Boenink et al. (2010) to anticipate ethical controversies regarding emerging technologies for the emerging technologies which help policymakers. This approach relies on scenario analysis anticipating the "mutual interaction between technology and morality" via the ethical assessment of the new technologies from a moral perspective. Taking a moral perspective into consideration may increase the validity of the emerged technology in society.

Finally, the fourth approach called the "Ethical Information Technology Assessment" (ETICA) approach provides a comprehensive overview of ethical issues that emerging technologies may play in the following few years (medium-term). ETICA aims to forecast the multiple possible futures using different methods to identify the anticipated impacts for having emerging technologies. Further, it anticipates the different constraints and social impacts of these emerged technologies (Stahl 2011).

Mechanisms, strengths, and limitations of each ethical approach are summarized in Table 7.1.

7.2.4 Risks Associated with Artificial Intelligence and Auditing

Despite the advantages AI introduces to any work, there are significant risks to be managed. The risks are specific to the AI application and to the type of business adopting it. The following are some of the risks posed by AI (Boillet 2018b):

Table 7.1 Mechanisms, strengths, and limitations of ethical approach

Ethical approach	Mechanism	Strengths	Limitations
Ethical Technology Assessment (ETA)	Ethical checklist includes nine issues related to emerging technologies	Although Palm and Hansson's approach is a good initiative can be followed with emerging technologies	– Miss the details of the kind knowledge needed to be acquired and the method of its' acquisition – There is a lack of clarification about the method of performing the analysis of ethical matters – The limitation of the nine issues included in the checklist
Ethical Impact Assessment Approach (EIAA)	An extended ethical checklist contains: – Range of ethical values – Range of ethical – Range of questions related to values and principles	– It contains many questions related to the ethical aspects of new technologies – It elaborates procedures for involving stakeholders in ethical analysis	– Lack of clarity about how forecasting takes place using expected artifact, applications, and social consequences – Lack of clarity about how participants' capability on answering questions related to the ethical checklist based on the knowledge that they have
Techno-Ethical Scenarios Approach	Scenario analysis	– It anticipates the mutual interaction between technology and morality – It focuses on detailed scenarios – It pays attention to moral change	– It is a descriptive and predictive approach, rather than normative and prescriptive – It does not describe moral issues ought to emerge from an ethical point of view – It misses ethical issues that are unlikely to collect much public attention but that are nevertheless important – It may identify moral controversies that may emerge in public debate that are based on a false or misguided understanding of the technology or its social consequences

Table 7.1 (continued)

Ethical approach	Mechanism	Strengths	Limitations
Ethical Information Technology Assessment (ETICA)	Multiple methods implemented to identify the followings for emerging technologies: – Projected artifacts – Projected applications – Capabilities – Constraints – Social impacts	Considering a wide range of technological properties, artifacts, applications, and ethical issues. And it aims to make use of state-of-the-art work in future studies	– First, its claim to adopt a futures studies approach is somewhat dubious, as the main sources for locating ethical issues that have been used in the ETICA approach are texts which are not based on futures research – A second weakness is that many of the ethical analysis undertaken in the ETICA project appears to refer to generic properties of the technologies that are studied

Source Brey (2000, 2012)

a. Programming errors: The AI applications are based on algorithms and any errors in constructing these would affect the results and overall conclusions.
b. Algorithm bias: AI application algorithms detect the patterns of data and codify it based on predictions, modeling, rules, and decisions. The machine algorithms are built on data and experience, which might suffer from interaction, latent or selection bias. This in turn would result in outcomes that reinforce existing patterns of discrimination.
c. Overestimating AI: Deep learning performs statistical techniques for identifying patterns in large amounts of data, but it cannot be expected to understand the same as humans do. If the input data is incomplete, biased, or of poor quality, AI will produce outcomes that are not reliable.
d. Threats from cyberattacks: Hackers can use machine algorithm hacking methods or botnets for accessing the network and sensitive data. This poses a security threat to the people and the government.
e. Lack of legislation: While the adoption of AI technologies is unabated around the world, the legislation dealing with the same are just coming to force. There is a strain on the existing laws and regulations to deal with the emerging challenges posed by AI. Most governments are adopting a 'wait and see' approach as the AI use and abuse is not clearly known (Walch 2020).
f. Reputational Risk: As AI deals with sensitive and confidential data, if the algorithm is biased, error-prone, or hacked, it could have the reputational risk to the organization that owns its.

7.3   Conclusion

The advancement of new technologies demands that the auditing firms and their teams become more agile (Newmark et al. 2018). In addition to the knowledge of accounting and auditing rules, auditors will be required to have a new skill set that demonstrates an understanding of the information systems, data science, and general business. The implementation of artificial intelligence in the auditing field is yet to be proven, and it is difficult to estimate how the audit process would undergo a change with machine learning; it would be useful for the auditing firms and auditors themselves to consider implications on future client engagements.

The preparation toward AI for auditing firms involves not just investment into the AI systems but also acquiring or developing the skill set necessary for using the same. While the firms would benefit to hire computer programmers, it would be useful for the accountants and auditors to have knowledge of coding to collaborate with the IT professionals more effectively in building the algorithms.

While the growth of AI is proliferated in all fields, there is a need to be vary of its ethical implications. Munoko et al. (2020) advocate a proactive approach rather than a reactive approach for the ethical implications of AI. Ethical governance is required by the firm implementing AI and regulatory bodies need to update their regulations to accommodate the risks associated with AI implementation.

AI has demonstrated benefits for the auditing profession; however, it is also warranting for caution in its use. AI algorithms are fed by humans, and it is important to note that the expectations must build on its performance based on the data and experience that goes into the system. Any work or profession can only use AI systems as complementary to the expertise in their respective fields.

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Chapter 8
With Application of Agency Theory, Can Artificial Intelligence Eliminate Fraud Risk? A Conceptual Overview

Ali Rehman

Abstract Purpose of this study is to introduce conceptual framework to identify whether artificial intelligence can support public listed companies toward eliminating and mitigating fraud concerns or not by utilizing Agency Theory in this concept. In the current business environment, fraud is a major concern not only for the organizations but also for the shareholders and society as a whole. This study reviews the literature related to organizational governance, corporate fraud cases, and artificial intelligence supporting the business toward fraud elimination and mitigation. This study reviews the benefits related to the utilization of artificial intelligence within the corporate world and at organizational level toward mitigation and prevention of fraud. This study integrates significant empirical research and literature to broaden the potentials of artificial intelligence over fraud prevention and mitigation. This study provides reasoning that artificial intelligence can be utilized as an agent for the Agency Theory. This study is distinctive from the others because artificial intelligence's support in the context of agency theory for the public listed companies has never been studied before; moreover, past studies have demonstrated artificial intelligence as control assistance only; whereas, this study will emphasize on artificial intelligence as support function and as agent working toward the support of management and shareholders for fraud mitigation and elimination.

Keywords Artificial Intelligence · Fraud · Agency theory · Public listed companies

8.1 Introduction

Despite the availability of many controls, regulations, and activities, fraud is still happening and with more intensity than before (ACFE 2020; Rehman and Hashim 2019). Fraud is not only impacting the financial performance of the organizations, but it also impacts their reputation and surfaces the potentials of growing concern issues. It can be considered that the manual driven controls are not effective, and innovation

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is required in the field of fraud prevention and mitigation. This innovation can be termed as artificial intelligence (AI) (Goertzel 2014; Zeljko et al. 2019).

Due to the rapid demand and availability of several resources, AI is being integrated into the fabric of every business and adopted in both the economic and financial sectors. AI can be utilized in diverse but related areas including fraud prevention and regulatory compliances (Ammanath et al. 2020). There are several ways in which AI can support the fraud mitigation and enhancement of controls; moreover, AI applied to organizational data can reduce fraud, enhance trust, and increase conformity with regulations (Aziz and Dowling 2019; Valkanov 2019). The association of AI and the fraud prevention practices places the organizational management at the center of an exciting new era (Govil 2020).

Available technologies can be utilized to commit and to counter fraud. Organizations are required to update themselves and maintain the pace of rapid and continuous changes. Despite of the world's changing dynamic, AI is not adopted by many organizations and the barriers still exist toward the implementation of AI (Ammanath et al. 2020). According to the recent survey, 84% of the boards do not understand the changing dynamics of technological advancements which could be related to their industry (Sarrazin and Willmott 2016); moreover, due to the complex nature of businesses and non-availability of AI, it is becoming difficult for CEOs to make good and intelligent decisions (Libert et al. 2017). AI is rapidly becoming an essential tool for business strategy decisions; however, technological adaptations are not happening fast enough (Sage 2019) and many business leaders struggle to understand how to use AI and how to obtain organizational benefit from it (Beck and Libert 2018).

Several frauds which occurred in the past could have been avoided if AI was utilized for fraud prevention and mitigation. For one of the recent fraud cases of Wirecard Company, AI was implemented toward organizational operations, however, fraud occurred as AI was not utilized or applied for fraud mitigation and prevention (Reuters 2020). Following are the few recent and prominent fraud cases presented in Table 8.1.

Fraud cases defined in Table 8.1 could have been avoided if AI was implemented properly and effectively. It is high time that the organizational focus should shift toward integration of AI for fraud prevention and mitigation (Lamboglia and Lavorato 2021) instead of only utilizing it as a support tool. There are several guidelines

Table 8.1 Recent and prominent fraud cases

Name of company	Amount of fraud	Source
WireCard	USD 2.1 billion	(DW News 2020; Henning and Kammel 2020)
Wells Fargo	USD 3 billion	(Flitter 2020)
Luckin Coffee	USD 450 million	(U.S. News 2020)
Dhofar Cattle Feed Company	USD 0.6 million	(MSM 2020a)
Oman and Emirates Investment Holding Company	USD 0.3 million	(MSM 2020b)

available toward the utilization of AI defining its principles and related ethical code (Serious Fraud Office 2020), but these guidelines or ethics code are not incorporated into the organizational policies or the codes of corporate governance developed by many countries' regulators. These available guidelines and codes can work as initial by-laws which can be tailored to the local needs of market and industry.

Organizational governance and its strategies can also be supported by AI. It is worth mentioning that AI is not about replacing the board but AI can assist and augment organizational intelligence and corporate governance; henceforth, contributing toward the governance management system of the organization (Gonzalez et al. 2020). AI can support and enhance strategic decision making, operational decision making, provide competitive advantage (Beck and Libert 2018) and can also play the role of agent as per the agency theory.

Agency theory defines the relationship between the agent and the principle. Agency problems arise when agents start working for their own benefits and neglect the instructions of the principle (Rashid 2016). Agency cost is the outcome of agency problems which occurs due to the lack of proper monitoring, diffused ownership, different risk and investment preferences, information irregularity, and moral hazards (Panda and Leepsa 2017). Problem of investment preferences, information irregularity, and moral hazards can easily be resolved by the implementation and utilization of AI (Agrawal et al. 2018).

Highest number of frauds occurred are in public listed companies (ACFE 2020). Public listed companies are regulated under securities exchange commission's issued codes of corporate governance, commercial company law and other related regulations. However, utilization of AI is still not visible in the codes or in the laws; moreover, guidelines/ principles issued by OECD (2019a) toward AI are also not implemented. It is worth mentioning that only forty-two countries adopt new OECD principles on AI (OECD 2019b) and none of these countries have AI as part of their corporate governance codes which could regularize the corporate environment against prevention and mitigation of fraud.

This study proposes that AI which is the independent variable have a significant direct relationship with fraud prevention and fraud mitigation which is the dependent variable. AI can be considered as part of governance management system and can play a vital role toward elimination and mitigation of fraud. This study also strives to incorporate relevant empirical research and literature to extend the intended potentials of AI on fraud prevention and working as an agent for the principal (shareholders).

This study is unique because up to the best knowledge of the researcher, there have been no study conducted before that verifies the AI impact on fraud prevention and mitigation with application of agency theory; moreover, previous relevant studies verify AI only as a support IT function but not as a governance management system that can assists board and related committees toward preventing and mitigating fraud. This study can assist regulators, professional bodies, and organizations in amending codes of corporate governance and organizational policies by adding the AI principles and sources as a compulsory part of the governance codes and support for board and related committees.

8.2 Literature Review

This section reviews related and relevant literature on the theoretical and empirical research related to AI and prevention of fraud. This section discusses the definition, concepts, and prior studies.

8.2.1 Artificial Intelligence

Artificial Intelligence (AI) is an advanced and stronger technological update which is revolutionizing the entire world by providing the capability and also enabling machines to perform cognitive functions such as observing, recognizing, comprehending, perceiving, learning, and interacting (Ergen 2019). AI is defined by Nilsson (2010) as:

> Activity devoted to making machines intelligent, and intelligence is that quality that enables an entity to function appropriately and with foresight in its environment

AI is emerging to be a business problem solver due to its three mature technological developments namely increasing computational power and storage at low cost, massive data processing, and advancement in algorithms (Agrawal et al. 2018; Ergen 2019). AI is capable of operating in uncertain and unstructured physical or information environments and is also capable of managing the unexpected external or internal events (Powell 2020; Burns and Steele 2020). AI is applicable in all business environments (Ammanath et al. 2020); however, it can be best utilized toward providing satisfaction to the shareholders where AI can provide a more predictive and strategic services to pick up on any potential issues before they arise (Burns and Steele 2020).

AI offers inability toward monetization and can impact business models and future forecast (Huang and Rust 2018). Moreover, the latest technology that combines the achievements of AI along with numerical and mathematical statistics has the ability to develop new and favorable approaches toward assessment of risk and information support (Chornous and Ursulenko 2013). AI along with safeguarding of money can also be more effective in preventing fraud, better decision making, improve transparency in operations, and measurement of financial statement disclosures (Grüning 2011). AI is providing hybrid set of technologies which are eventually supplementing and changing the mode of operations (Issa et al. 2016). AI can be useful in dealing with the large volume of data and can assists in developing the right analysis empowering organization to arrive at effective and efficient decision making (Lamboglia and Lavorato 2021).

8.2.2 Fraud

Fraud is one of the permanent components of organizational top ten risks as it can be considered as major threat capable of distorting organizational activities (Singleton and Singleton 2010; PWC 2020; Siregar and Tenoyo 2015). Fraud either cyber or otherwise can be considered as the menace where organizations not only suffers monetarily but also gets their reputations impacted adversely. Fraud can be defined as deceitful and intentional act which impacts organization. Fraud is conducted by the organization or on the organization for the benefit of the individuals (ACFE 2020).

In accordance with the recent survey, 47% of the organizations had experienced fraud in the past 24 months. It is worth noting that in last 20 years, this is the second highest reported level of incidents. However, the battle against fraud is evolving as new technology is providing controls such as AI which are capable of preventing and mitigating fraud (PWC 2020). Major reasons for the organizations to suffer from fraud are poor fraud risk management, poor internal controls, lack of ethical values, and management overriding of controls (Siregar and Tenoyo 2015). With self-learning capability, AI can enhance itself toward providing more proactive solutions to the organization and can mitigate the fraud risk.

It is becoming easier to commit traditional fraud with the utilization of technology and assistance of AI (Sage 2019). In one of the recent fraud cases, fraudulent company created a fake domain of supplier website and asked the customer organization to change the supplier's bank account details. Almost six months after the fraud, customer organization received messages from the original/actual supplier about the out-standing payments and that is the time it was revealed that the organization suffered a fraud (MSM 2020a). This fraud could have easily been avoided if AI was utilized as a control tool instead of a support tool. Furthermore, AI could have identified the anomaly in the pattern and could also identify the control weakness in real time.

With the utilization of AI, organizations can strengthen their control environment (Goodman 2015) as AI can assists in executing and recording transactions with minimal human intervention, validate and record unchangeable transactions with opportunities to avoid human error and combat transactional and reporting fraud, increased visibility which contributes to transparency, identify deviations from standards on a timelier basis and facilitate the removal of management's manual intervention from the processes.

8.2.3 Artificial Intelligence and Fraud Prevention and Mitigation

AI and governance management can work together toward providing more predictive and strategic services by utilizing the available data to identify any potential issues before they occur (Aziz and Dowling 2019; Alareeni 2018, 2019; Salman and Laouisset 2020; Hasan Al-Naser 2019; Linda et al. 2018).

In current business environment, rise of online business transactions has made the organizational compliance task more difficult to complete. However, AI can provide solutions to such compliance task as it can handle the data review with more speed and accuracy. AI is capable to detect and prevent anomalies; moreover, it can also help to assign accounting transactions to the correct categories confirming that the organization records everything which is relevant and has actually occurred for its business.

Overall business process can be improved if automated anti-fraud procedures are applied and implemented (Agrawal et al. 2018). Table 8.2 defines differences between prevention of fraud by AI versus the traditional approach of preventing fraud (Columbus 2019).

AI has potential to prevent and detect fraud in real time (Verver 2020). Moreover, AI is best suited to provide much needed satisfaction to shareholders and strategic decision makers that is lacking in the current business environment. AI is capable of functioning as accelerator or antidotes of fraud and fraudulent activities (Yeoh 2019).

AI provides solutions to fix the current challenges faced by the organization (Roszkowska 2020) and affects several issues that historically led to serious frauds and financial scandals (Simon et al. 2017). AI enhances the information reliability of the financial statements including the way transactions are initiated, processed, and authorized with the capability to make the system incorruptible (Deloitte 2016).

With minimal human intervention and learning from the feed data, AI automates analytical model building, identify patterns, and make decisions. Furthermore, algorithms signals via interconnected aspects and multi-stage learning process with deep learning systems identify and solve problems without being implicitly programmed. AI develops data and models to solve semi structured and unstructured problems and

Table 8.2 AI v/s traditional approach of fraud prevention

AI approach	Traditional approach
Relies on experience and take into account emerging activities, behaviors, trends, and transactions anomalies	Relies on rules with the utilization of excel for analyzing past fraud patterns with no insights to the future
Capable of detecting fraud in real time	Minimum identification time is six to eight weeks
Possible to prevent sophisticated abuse attacks	Difficulty in identification of customer abuse of identification of collusion
Provides fraud analyst with immediate risk scores and perceptiveness to minimize the fraud	No such report or analysis exists. Analyst must develop their own working and with one market at a time
Capability to enable greater controls over charge back rates and operational cost	Require tremendous effort to identify additional or hidden cost
Provides greater compliance process with policies and regulations	Difficult to identify non-compliances in real time

Source Columbus (2019)

based on large databases of past events and trends create forecast and predictions (Roszkowska 2020).

Initial data in AI is the history and instances which raised the red flag along with the anomalies identified by management in the past. Based on this data, framework can be developed which could again be tried and tested by organization enabling AI to detect red flags and potential frauds in the newly fed data (Ghahramani 2015). Such practice introduces more accurate data, less human intervention and enabling organization to investigate further for any potential fraud and develop more preventive controls (Smith 2017).

From the shareholders' perspective, adopting new technologies such as AI to detect errors, frauds, control irregularities, and financial records falsification assists shareholders in making proper and timely decision.

8.2.4 Agency Theory

Agency Theory is described as shareholders delegating several responsibilities including decision making authorities to a group of experts with the perception that they will achieve success for their organizations and reduce agency problems (Afza and Nazir 2014; Hamdan and Al-Sartawi 2013). Agents are hired by one or more person(s), called the principal(s), and the agent is acting on behalf of the principal. Agency Theory is utilized to support the dominant role of agents on corporate governance (Rehman and Hashim 2020; Earnest and Sofian 2013).

In accordance with the Agency Theory, delegation of authority can create problems when agents disregard the concerns of their principals and give importance to their self-interests and started gathering private benefits. Probable reason behind such mindset was that the entire task was performed by the agents, and they do not want to provide benefits to shareholders as they only invested the money and not performing any operations (Adrian et al. 2009). Such kind of behavior requires protection and monitoring which could certainly be provided by AI.

AI is becoming a necessary tool toward the development and implementation of business strategies and organizational policies. Investment in AI is becoming strategic cost instead of operational cost as it assists in reducing uncertainties and provides practical solutions (Agrawal et al. 2018). Investment in AI is as similar to the hiring of an agent and providing economic benefits to that agent; moreover, AI is capable to handle day to day task with accuracy and much more precision that can serve the true purpose of corporate governance (Libert et al. 2017) and at the same time provide satisfaction to the principal. If AI is working as an agent for the Agency Theory, then agency cost can be avoided or completely eliminated. Moreover, AI which is built from current strategic strength can provide digital transformation strategies that can assists in reimagine work and decision making around distinctively human capabilities (Moloi and Marwala 2020).

AI could be used to enhance strategic decision making by tracking capital distribution patterns and at the same time is capable of highlighting potential red flags. AI

can augment operational decision making by scrutinizing internal communication and forecasting incites and also by recognizing changes in customer demographics or preferences that could create product or strategy implications (Else and Pileggi 2019). Few of the scholars suggested that the most appropriate response for enhanced strategic decision will be to incorporate AI in the practice of corporate governance and strategy (Libert et al. 2017) i.e., AI working as an agent for the principal.

Agency Theory requires that the principal and agents should be the persons with legal rights and legal claims. With the emerging role of AI and its probable assistance to the principal, definition of the personhood within Agency Theory will change. The AI can be a person which is formed by an algorithmic entity (Powell 2020). Algorithmic entity can be defined as "*advanced autonomous systems paired with limited liability companies that have no individual members*" (LoPucki 2018). This can be considered as an appropriate development enabling AI to attain legal personhood for the purpose of Agency Theory.

Fraud is the main cause that creates great financial losses in organization and creates uncertainty between organizational management and shareholders (Bhasin 2016). Fraud should be assessed and controlled in a manner that its effects will be minimized, controlled, or eliminated (Wyk 2015). In Agency Theory and as explained above, AI could be an agent appointed by the shareholders that could perform fraud risk assessments and hence enhance corporate governance by preventing, minimizing, controlling, and eliminating fraud i.e., eventually reducing the fraud element and also eliminating the agency cost.

8.3   Conceptual Framework

The probable conceptual framework for this study proposes that the independent variable which is AI influences the dependent variable which is fraud prevention and mitigation. AI can be examined through its capability to ensure business transparency, examining and monitoring effectiveness of internal control and maintain high integrity in organizational business activities and operations.

AI is proposed as the independent variable based on the fact of literature and previous research, which reveals that AI can have strong influence on fraud prevention and mitigation. Agency Theory suggests a series of procedures to reconcile interest of shareholders and organizational management. These procedures include monitoring and implementing anti-fraud measures with other governance instruments; thus it can be substantiated that fraud prevention and mitigation are dependent variables which can be influenced by AI.

8.4   Conclusion

AI is an inevitable part of our daily business life. Many transactions are processed with the utilization of AI and yet fraud occurs within these transactions. Major reason for the fraud occurrence in this digital world is that the AI is still being utilized as support function and not as fraud prevention and mitigation activity and as governance management system. Given the considerable enhancements in AI capabilities, this study goes beyond this simple vision and advances the notion that AI can be utilized as agent of the Agency Theory and can assists board and organization toward prevention and mitigation of fraud.

This study proposes that AI which is the independent variable has a significant direct relationship with fraud prevention and mitigation which is the dependent variable. AI acting as an agent and with the application of Agency Theory can be considered as part of governance management system and can play a vital role toward elimination of fraud.

Notably, this study positions itself in extending previous studies on AI to a new perspective by presenting it as an agent of the Agency Theory that can enhance governance, mitigate fraud, and prevent fraud. This study is expected to contribute and bring new insights and views on AI that have not yet been explored. This study could offer vast opportunities for future researchers to investigate further via diverse perspective pertaining to AI.

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Chapter 9
The Study of Islamic P2P Crowd Funding Model as an Alternative to SME Financing in Nigeria

Shehu Abdulkadir, Auwal Adam Saad, and Ashurov Sharofiddin

Abstract This study adopts an exploratory approach to the Fintech supported Islamic Peer-to-Peer (P2P) crowd funding model structured on Mudarabah contract as an alternative response to SME financing in Nigeria. Mudarabah is a Trustee Partnership between a financier and an entrepreneur, where profits are shared, while the financier bears the whole financial loss. Secondary data would be relied upon in the study to support the need to explore the adoption of Fintech to support the Islamic P2P crowd funding, as an alternative to SME financing within the Nigerian financial landscape. The data were primarily sourced from journal articles, crowd funding platform websites and portals, and websites of players in the SME ecosystem. The collated secondary data contents were analyzed to demonstrate that P2P crowd funding supports a direct, semi-formal, and seamless contact between an investor(s) and an entrepreneur(s). The study found that a Mudarabah contract becomes more suitable for SMEs, especially the startups, since it tends to promote sustainable source of financing that aligns with the Islamic Social financing ideals and is conductive for the attainment of inclusive and equitable economic development. The recommendation of the study is that since the Fintech supported Islamic crowd funding has been proven to be an efficient, cheap, and innovative means of providing funding for SMEs and startups in emerging economies, it should hence be explored in Nigeria to engender the needed economic recoveries in the post COVID-19 pandemic era.

Keywords Fintech · Islamic crowd funding · Mudarabah · Nigeria · Peer-to-Peer · SME financing

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9.1   Introduction

Basically, crowd funding involves a collective and self-committed process of gathering funds by individuals to attain a specific objective (Shneor et al. 2020). Islamic crowding funding ensures that the peer-to-peer sourcing process is sharia compliant and founded on the platform of equity, fairness, justice, ethical, and sustainable practices. It can be a small social finance project of Zakat and Sadaqah or innovative and impactful startup financing endeavor (Beik and Purnamasari 2011). Digital Technology has provided a platform that has made the process easy going and more transparent with seamless update on information of goal identified. The Fintech based Islamic P2P crowd funding model structured on Mudarabah contract will provide an alternative financing instrument for SMEs financing especially startups. Mudarabah contract is an asset-based transaction with equity-based sharing of risk and profit. It is guided by the Master Mudarabah crowd funding agreement that clearly spells out the risk and profit or loss sharing framework for the investor and the entrepreneur (Bazza et al. 2014). Heavily regulated Financial Institutions with sophisticated processes don't have the necessary structure to support the nurturing and development of innovative start up enterprises that this model provides. It has also been rightly observed by many scholars that Finance is one of the major constraints that hinder the survival, growth, and development of SMEs in Nigeria as in other developing countries (Olusoji 1999; Eniola 2018; Ekpenyong and Nyong 1992) has also opined that source of Financing SMEs in Nigeria are grossly inaccessible. Even where it is available you find out that it is not feasible to obtain. This is because of high cost of fund and stringent requirements which must be met. The Islamic P2P crowd funding Model doesn't require sophisticated process to develop and it sharia framework grants respite during period of uncertainty and also promote equity and fairness in its practices.

The Small and Medium Enterprises (SMEs) sector plays a pivotal role in driving global socio-economic growth, particularly in emerging economies like Nigeria. The sector is globally recognized as the largest employer of labor and fosters entrepreneurial innovation and local capital formation. Globally SMEs are characterized by limited cash reserves, smaller client bases, and less capacity to manage commercial pressures than larger corporations. However, the Nigeria MSME sector is characterized by lack of access to finance and high cost of finance, which affects the financial and operational sustainability of enterprises—a dynamic that has been a constraint on business scale mobility and a key driver of the high mortality rate among startup enterprises (Ali 2006).

The SMEs especially startups are the worst hit by the ongoing COVID-19 pandemic (International Labour Organization 2020); this is because during turbulent period they have least resilient to withstand to shocks exerted on their financials and operations. Analysts are predicting that around 60% of startups may close before the crisis is over (Kalidas et al. 2020). More so, the pandemic has exposed the vulnerability traditional financing models to SMEs sustainability, with many SMEs closing

Fig. 9.1 Total worldwide Crowdfunding Volume, excluding China (2015–2018). *Source* https://p2pmarketdata.com/crowdfunding-statistics-worldwide/. Accessed 31 October 2020

shop and others requesting for loan refinancing, restructuring, and longer moratorium. Crowdfunding seems to be poised to rescue economies in view of its consistent popularity around the globe (Fig. 9.1).

This study is divided into five sections. Section 9.1 introduces the concept of Islamic crowd funding as an alternative and sustainable model of financing SMEs with specific emphasis on startups enterprises. Section 9.2 reviewed, examined, and discovers new and detailed understanding of how Islamic P2P crowd funding model serves as an alternative to SME financing in emerging economies. Based on reviewed literature, it further identified some gaps in the literature reviewed and also provided insights on how Islamic P2P crowd funding model will serve as a stimulus for SMEs post-pandemic recovery. Section 9.3 discusses on the methodology employed by the study in meeting up with the objective of the study. Section 9.4 expatiated on the various models of P2P crowd funding which include Musharaka, Istisna, Qard, Bay Al Salam and the Fintech Mudarabah Model Adopted by this study. Finally, Sect. 9.5 concludes the study by discussing the findings and proposing recommendations while identifying areas for future research.

9.2 Literature Review

The objective and workings of Fintech and crowdfunding, had been argued, are aligned and similar to that of Islamic financial intermediation. This is because these concepts are about building collaborations toward attaining a productive business o

economic endeavor, while co-sharing the reward and risks that might accrue from the business or economic endeavor by the participants. Fintech on other hand is said to be tied to the recent evolution of crowdfunding, because crowdfunding became popular in recent times sequel to the global economic crisis, which left in its wake, businesses struggling to access funding from conventional financial institutions. Fintech thus came handy as an innovative solution, bringing with it a democratized access to finances for businesses. Hence crowdfunding, supported by Fintech became popular in Europe and accounted for successes of businesses and projects that would have otherwise been defunct. Key merits of Fintech supported crowdfunding include cost efficiency from the supply and demands sides of financial intermediation, its flexibility and amenability to meet the demands of Shariah complaint contracts. Its demerits however include the fact that very few financial industry regulators, especially in the emerging economy nations, have put in place regulations on crowdfunding activities, hence the fears about its stability and investor confidence in such climes. The above notwithstanding, if the Islamic financial intermediation principles were to be effectively aligned with that of the Fintech supported crowdfunding, same would foster entrepreneurial ecosystem and promote social and economic development of emerging economies that care to consider same (Biancone et al. 2019).

The above sentiment was shared by other studies (Biancone and Mohamed Radwan Ahmed Salem 2018, 2019) which argued that the key areas of alignment of Islamic financial intermediation system with the Fintech supported crowdfunding is mainly the social responsibility inclinations, ethical precepts, and fair dealings in commercial transactions. It was also posited that proper leverage on crowdfunding as a means of financing MSMEs would enhance the economic growth of emerging nations (Aderemi and Ishak 2020). Further, Fintech supported Islamic P2P crowdfunding platforms are said not to be something new to the European Societies. In recent times, however, there has been the extension of these offerings to SMEs through the establishment of "Qardus" in the United Kingdom, coming in about half a decade after the establishment of Kapital Boost, Asia's first Islamic P2P crowdfunding platform for SMEs (CIBAFI 2020).

Not many of the Muslim majority countries have stood up to regulating the practices of Islamic Crowdfunding, in the view of Abdullah (2016) including Malaysia which is viewed as an advance market for Islamic Finance practice. There is thus the call for a "proper and holistic Shariah governance framework for crowdfunding activities" especially for the equity-based financing Shariah contracts like Mudarabah, Musharakah, among others. Further a near absent legal framework for community-based crowdfunding activities should be remedied (Abdullah 2016). This position was reinforced by a subsequent view which believed that the Malaysian Islamic finance has yet to resolve the challenge of product diversification that meets customers' needs, especially the financing needs of start-up and the SMEs (Abdullah and Oseni 2017).

In recent times, Peer-to-Peer (P2P) financial intermediation are gradually assuming universal importance, for which innovative Shariah complaint structures need to quickly evolved to meet the market yearnings. It is thus advocated that the

Malaysian and the GCC Islamic financial industries need to brace up to these market demands especially enduring frameworks for Islamic Fintech. Primacy, it is advocated, should be accorded to the equity-based Islamic finance contract because of their role in socially impacting and sustainable finance (Sa'ad et al. 2019).

9.3 Methodology

The methodology adopted by this study is the qualitative research method. In furtherance of the study, reliance was placed on secondary data obtained from journal articles, e-books, crowd funding platform websites and portals, and other online resources to support the position advocating the need to explore the adoption of Fintech to support the Islamic P2P crowd funding, as an alternative to providing financing for SMEs in Nigeria. By adopting the usage of secondary data, this study intends to allay ethical issues that may occasion blemishes on the study. In addition, adoption of the usage of secondary data as a source provides a cheaper process of research. The collated content of the secondary data was analyzed to achieve a credible result. Triangulation was sought to be achieved through an array of the secondary source of data such as scholarly articles, websites, and portals of crowd funding players, in addition to the websites of other players in the SME ecosystem.

9.4 Islamic P2P Crowdfunding Models

There have been studies on crowdfunding structured on Shari'ah contracts. Although the studies identified the concerns that Islamic finance version of crowdfunding is still at the budding stage and for which sufficient awareness and regulatory regimes are urgently required, it proceeded to classify same into five models, namely; Zakat-based model, Infaq-Sadaqa-Waqf-based model, Qard-al-Hasan based model, Shrikah-based model, and Lending-based model (Achsien and Purnamasari 2016). Another study classified them into four mainstream models, namely, Sadaqa-based crowdfunding for Donation-based convectional crowdfunding, Mudarabah-based crowdfunding stand for peer-to-peer convectional crowdfunding, Mudarabah-based crowdfunding as equity-based convectional crowdfunding and Hiba-based crowdfunding represent reward-based conventional crowdfunding (Thaker 2018).

9.4.1 Equity-Based Models

The equity-based models are structured on contracts of Mudarabah and Musharakah. Mudarabah contract is a trustee partnership between an entrepreneur and a financier.

The financier provides the financing while the entrepreneur undertakes the day to day running of the venture. Where the business venture records profit, same is shared according to agreed ratio. However, where loss is recorded, the financier bears the financial loss, while the entrepreneur gets no compensation for managing the venture. It had been argued that crowdfunding powered by the Mudarabah contract seemed to be the more popular of the equity-based models among most of the platform of Islamic crowdfunding (Hendratmi et al. 2019).

Musharakah, on the other hand, is a partnership contract where the partners pool their resources either on equal proportion or otherwise. The partners then jointly manage the venture, or delegate the management to any of the partners. Profits accruing are shared on agreed proportion, but losses must be shared strictly according to capital contribution proportion. There have also been positions that Musharakah contract is suitably configured for Islamic crowdfunding investment (Wahjono et al. 2020). The diminishing Musharakah is another variant that needs affords efficient financing for SMEs and startups (Marzban and Boseli 2014). In all, in view of findings of studies that there are equity-based Islamic crowdfunding offerings effectively aid the productivity of MSMEs and startup businesses, it has been advocated that more variants and more platforms be created to meet the demands (Achsien and Purnamasari 2016).

9.4.2   Social Finance Based Models

Social Finance Based Models include the Zakat-based model, Infaq-Sadaqa-Waqf-based model, Qard alHasan-based model. Zakat simply refers to the poor due paid by the wealthy Muslims whose wealth attain a certain threshold (*nisab*) continuously for the period of a year (*hawl*). Infaq refers to spending, Sadaqa means charity and Waqf means endowment of an asset. Qard-al-Hasan is a virtuous loan giving out with the clause of returning the principal sum to the owner in the same condition without any increase in the stipulated time (Ariffin and Adnan 2012).

These classes of models are described as social finance models because of their charitable and an amalgam of pure and impure altruism (Global Sadaqah 2018). The financiers under the arrangements could have as their objectives combating of poverty and the attainment of the socio-economic welfare of the less-privileged beneficiaries, especially the startup businesses and the MSMEs. The success of these models had been recorded in some studies which recorded that these models have the propensity to positively impact startups and MSMEs businesses the same way it can provided the needed development for a society's economy inclusively (Febianto and Ashany 2012).

9.4.3 Trade Based Models

Trade or lending-based models for Islamic Crowdfunding include the contracts of Murabaha, Istisna, Salam, and Ijarah. Basically, Mudarabah is a cost-plus profit financing contract where the vendor provides the purchaser of an asset with a full disclosure of the cost price of the asset and the selling price (i.e., the profit over the purchase price). Istisna is one of the exceptions to rules of sale in Islamic commercial jurisprudence (availability and tangibility of asset to be traded), it is usually deployed for financing assets to be manufactured or developed. Salam is the second exception to the general rule of sale of Islamic finance jurisprudence. Like Istisna it is usually deployed for financing assets that are not off the shelf, such as crops, etc., while Ijarah is a lease contract between the lessor and the lessee, which may or may not culminate in the transfer of the legal ownership of the leased asset from the lessor to the lessee (Iqbal and Mirakhor 2011).

Of the models under this class, Mudarabah model appears to be the most popularly used. The primary reason for this appears to be because it is a sale instrument involving the sale of an existing asset and that guarantees fixed receivables to the investors, which might be in installments or bullet payment. This model, along with the rest of the models are adjudged to be suitable as reward-based model, or lending-based model which offers Shariah compliant fixed returns to the crowdfunding investors (Hendratmi et al. 2019).

9.5 Conclusion

Findings
The study found that Mudarabah model of Islamic crowdfunding seems to be the most popular modality of equity financing for startups and MSMEs, which afford the stated segment of the economy cheap and efficient access to finance without the necessary requirement for collaterals, especially when Fintech is leveraged upon, to enhance transparency and accountability. Collateral requirements and lending-based crowdfunding had precluded many startups from transforming their innovative ideas into fruition.

Nigeria is a country with about 54% youth population, reputed for a rich culture of entrepreneurship and creativity. The lack of efficient access to cheap funds as source of production or transformation of innovative ideas into reality has continued to impact the socio-economic prosperity of the nation. Hence, the need to consider the adoption and promotion of the Mudarabah-based crowdfunding offerings which had been adjudged to be the most suitable for startups and MSMEs financing. This is because the Mudarabah crowdfunding model would promote sustainable source of financing that aligns with the Islamic social financing ideals and is conductive for the attainment of the nation's inclusive and equitable economic development.

Limitations

The scope of the study is limited by factors that include the lack of credible and centralized source of data on Islamic crowdfunding platforms and activities. The absence of legal and regulatory framework on the Islamic crowdfunding offerings and general lack of awareness on the prospects and opportunities embedded in the Islamic crowdfunding.

Recommendations

The study recommends the urgent need for the concerned regulators, policy makers, and stakeholders to adopt and leverage the opportunities provided by the Fintech supported Islamic P2P crowdfunding platforms structured on the Mudarabah Contract, for funding of businesses, especially startups. It has proven to be an efficient, cheap, and innovative means of providing funding for SMEs and startups in emerging economies. Further, doing this would promote innovation among the nation's SMEs ecosystems. It would equally enhance scalability of enterprises and sustainability of SMEs, especially in the post COVID-19 pandemic era, when aggressive economics recoveries are been pursued around the globe.

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Chapter 10
A Study on the Implementation of International Banking Standards by BCBS with Special Reference to Basel III Norms in Emerging Economies: Review of Empirical Literature

Asif Pervez, Nadia Mansour [ID], and Rohit Bansal

Abstract Basel Norms have been used by the Banks to manage risk in the banking system. Basel Committee on Banking Supervision (BCBS) releases banking standards after periodical intervals since 1988. The purpose of this study is to study the writing accessible on the Basel III Implementation, the readiness of bank for Basel III, and its effect on banks by reviewing the experimental investigations that were leading worldwide after the standards were proposed. Basel II norms were not effective in preventing financial emergencies in 2007–2008. Basel III norms were presented in 2010 by Bank for International Settlements due to this financial emergency. Since then, different studies have been conducted on the readiness of banks for Basel III, implementation of norms, and its impact on the banking framework. The present study endeavored to review tremendous writing accessible on Basel III and attempted to assess the pattern of different research perspectives identified with the Implementation of Basel III. The subjective methodology was used to study and review major findings of examination papers.

Keywords Basel III Norms · BCBS · Readiness · Implementation · Review

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10.1 Introduction

The financial system backs on two core pillars: Risk and Return. The banks must cater to managing these risks as well as returns as a stable banking system is an indicator of a robust financial system of an economy. The stability and efficiency of banks need effective capital adequacy management, liquidity management, asset management, and risk management. Basel norms have been an attempt by the Bank for International Settlements to set norms for managing risks in the banking system at a global scale. With the changing times, Basel Committee on Banking Supervision periodically releases banking standards since 1988. Consistency in the adoption and implementation of Basel Banking standards makes the banking system more resilient and efficient and encourages transparency in the regulatory framework of banks worldwide.

10.2 History of BCBS

The history of the Basel Committee on Banking Supervision dates back to 1974 when there came a wave of severe disturbance in the International Currency and Banking markets. It was set up by the Governors of Central Banks of ten countries naming Canada, Belgium, Italy, Japan, France, the Netherlands, the USA, the United Kingdom, Germany, and Sweden. Since then, it has expanded its horizon from G 10 to forty-five institutions. The primary goal of the committee was and has been to improve the functioning of Banks the world over for bringing in financial stability (Mansour and Zouari 2019) at a global scale along with consistent support among the member countries on matters related to banking regulation and supervision. The Committee has developed a series of international regulatory standards to achieve its goal: BASEL I, BASEL II, BASEL III, and newly proposed BASEL IV (Mansour et al. 2021). This study is concerning BASEL III norms. The norms/regulatory standards are revised occasionally in tune with the changing scenario. The reason is that the banking business is precarious because of its spillover effect. If one banking institution is affected, like a contagious disease, it spreads all over the economy.

The global financial crisis of 2007–2008 has been devastating worldwide as it resulted in a shortage of liquidity and credit accessibility across the countries. The entire banking system got damaged leading to the international banking crisis. Many banks went bankrupt while few were just surviving. There was an excess of risk on banks that was required to be catered to. International capital flows were affected and so was economic activity. In the heart of this crisis, the BCBS launched the first version of Basel III in 2009. It was formulated to achieve two important goals: one was to make banks more strong and sound, and secondly to preserve and regulate banking activities globally.

10.3   Journey from Basel Norms I to Basel Norms III

If we analyze the journey of Basel regulations from Basel I to Basel III, there has been a huge transition. Basel I norms have emphasized the awareness of capital needs in managing all the credit risk and market risk. Basel II emphasized different forms of capital needs to meet the adequacy ratio. Basel III is based on Basel I and Basel II norms. The primary aim of Basel III norms is to boost capital adequacy and improvement in managing Market Risk, Operational Risk, Credit Risk, Liquidity Risk, and Counter Cycle Risk. The prime focus is: one was to make banks more resilient, strong, and sound; and secondly to preserve and regulate the banking activities globally. So, we can observe navigational changes in new regulatory Banking standards of BCBS laying an impact on banking capital management.

According to the BIS press release, it has been announced by the Basel committee that there shall be a delay in the introduction of Basel III till 1st January 2023 and also a delay in accompanied transitional arrangements for the output floor till 1st January 2028. This delay is in response to the immediate financial needs and to maintain stability in the financial system due to the impact of COVID-19 on the entire banking system worldwide. This announcement will possibly help in ensuring resilience in the banking system.

10.4   Basel III

According to Basel Committee on Banking Regulation, "Basel III is a list of comprehensive reforms whose goal is to strengthen the regulation, supervision and risk management of the banking sector."

Basel III framework was presented by Bank for International Settlements (BIS) in 2010 as a reaction to the financial emergency of 2007–2008. The fundamental explanations for the presentation of Basel III were the financial emergency in 2007–2008 and different weaknesses in Basel II (Boora and Jangra 2018). The execution of Basel III began in 2013 and was to be finished by 2019. Basel III stresses the security and strength of banks, requirement for improving the quality and amount of capital, liquidity benchmarks, and improve transparency (Jayadev 2013). There are three aspects of Basel III commonly known as the pillars (Fig. 10.1).

Different issues in the Basel III standards are additional equity, Capital Conservation Buffer (CCB), countercyclical capital buffer, leverage and liquidity (Singh and Gupta 2017). The soundness of the comprehensive financial framework has risen as a significant issue for controllers in the prevailing worldwide financial situation (Kapoor and Kaur 2017). Basel III standards give a more prominent spotlight on stricter standards for capital prerequisites, liquidity, and leverage (Singh and Gupta 2017). Basel III standards would altogether affect the benefits and loaning capacities of the banks (Mirchandani and Rathore 2013). Through the above analysis, the following are the components of Basel III standards (Fig. 10.2).
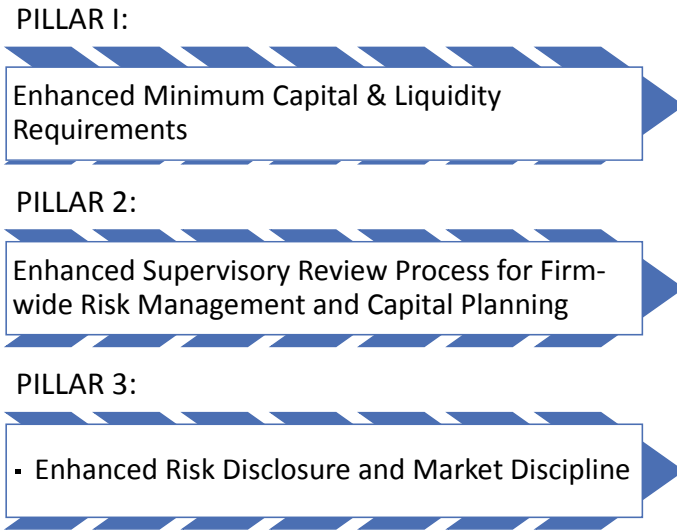
PILLAR I:

Enhanced Minimum Capital & Liquidity
Requirements

PILLAR 2:

Enhanced Supervisory Review Process for Firm-
wide Risk Management and Capital Planning

PILLAR 3:

- Enhanced Risk Disclosure and Market Discipline

Fig. 10.1 Pillars of Basel III norms

Higher Tier I and Tier II Capital requirements

Capital Conservation Buffer

Counter Critical Measures

Liquidity Measures
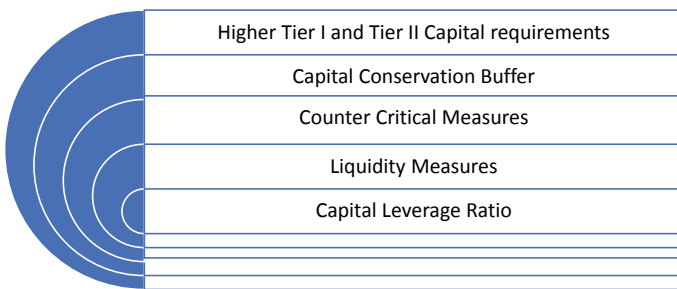
Capital Leverage Ratio

Fig. 10.2 Regulatory elements of Basel III standards

Numerous researchers are of the view that proper usage of new Basel III standards will guarantee banking area flexibility to stuns and emergency (Kapoor and Kaur 2017) while a couple accepts that Basel III makes the financial practice unquestionably increasingly troublesome and it does not go far to shield banks from contagion effects (Samitas and Polyzos 2015).

Consequently, the principle point of this review is to offer a thorough survey of research papers, which have concentrated on Basel III standards usage in the banking area, the readiness of banks for Basel III, and its likely effect on execution and loaning conduct in the banking business in emerging economies. The present examination is isolated into five areas. Section 10.1 introduces the study; Sect. 10.5 depicts the

examination plan of the investigation containing its need, destinations, and approach; Sect. 10.6 presents essential investigation; Sect. 10.7 is about discussion; Sect. 10.9 shows the conclusion of the investigation; and Sect. 10.10 gives suggestions of the examination.

10.5   Research Design

This section discusses the research designed that has been used in the review paper.

10.5.1   Need for the Study

The recession made it understood that economies were put in danger by banks predominantly in the USA and other countries. To maintain a strategic distance from the circumstance again, a need was felt that the banks ought to deal with the hazard all the more carefully. Basel III standards were created to deal with the hazard all the more wisely to forestall any such emergency to happen once more. Basel III standards power the banks to keep up the bigger capital base, improving liquidity and expanding straightforwardness. Albeit numerous researches were directed on Basel III standards, yet no investigation gave a far-reaching review of the Basel III standards as investigated by various specialists, especially in emerging economies. Henceforth, the present investigation centers around Basel III arrangements, implementation, its effect, and different opportunities and difficulties that emerge.

10.5.2   Main Aims of the Study

The present review paper has been aimed to achieve the following objectives.

- To analyze the literature on the readiness of banks and execution of Basel III proposals in emerging economies.
- To study the probable effect of Basel III standards execution on banks.
- To examine different opportunities and difficulties that emerge in the execution of Basel III in banking.

10.5.3   Sources and Methodology

A comprehensive study of various researches was directed for the present investigation considering research investigations of recent years from 2011 to 2018. Available Research papers and Articles in different databases, for example, JSTOR, Emerald,

Social Science Research Network (SSRN), Science Direct Base, and Research Gate were taken into consideration. Research papers and articles, identified with Basel III standards, were utilized for the present investigation. Chosen researches were deciphered and analyzed for their aim, sampling, and significant outcomes.

10.6 Critical Analysis of Studies

Different studies that have been conducted earlier on Basel III standards are shown in Table 10.1. Other than this, studies conducted on Basel III standards were deciphered and fundamentally analyzed and have been abridged beneath. This area has been separated into four sub-segments.

10.6.1 Readiness of Banks for Basel III Norms

Mirchandani and Rathore (2013) concluded that PSU banks had enough financial resources to meet instant capital adequacy needs. However, credit risk, supervisory review, and market discipline were not covered by the study. Exploration of the preparation of banks in the Indian public sector for Basel III revealed that they were positively motivated for implementation of the latest Basel norms, the awareness level of bank managers was sufficient, banks had required resources and were aware of the expected benefits and expenditure involved in Basel III adoption (Boora and Jangra 2018). A study on the compliance of banks in the public sector with proposed norms suggested that the regulations would result in greater stability of the banking industry and predicted consolidation of Indian banks through a process of mergers and acquisitions (Santhi 2014). Al-Tamimi et al. (2016) reported well awareness of bank employees in the UAE about the positive outcomes of Basel III norms adoption and that the banks were ready for adoption of these latest norms as they had trained manpower and required resources.

10.6.2 Implementation of Basel III Norms

Shamsuddin (2013) found that Malaysian banks are well-positioned to adopt Basel III proposals without any significant difficulties. Another study revealed that effective execution of these latest regulations was ensured in Serbia resulting in strengthening the risk management framework (Ljubic 2015). In another study, the factors influencing the execution of the norms in Ghana were evaluated and more emphasis on the bank-specific factors was suggested in identifying the level of preparation for Basel III (Osei et al. 2016). A study of Basel III norms implementation in Kenya concluded that credit risk management, financial stability, balance sheet structure, and deposit

Table 10.1 Empirical studies related to implementation and impact of Basel III norms

Author	Country	Research objectives	Sample	Methodology	Findings
Nucu (2011)	Romania	Analyze the impact of Basel III introduction upon the Romanian banking system	Romanian banking system	Descriptive	For banks, the challenge is being faced from areas: design, data quality
Mirchandani and Rathore (2013)	India	To study the impact of Basel III norms on the capital adequacy of the public sector banks	Five major PSB in India	Descriptive	PSU banks had sufficient liquidity to meet the instant capital adequacy requirement
Uprety (2013)	Nepal	Challenges and Opportunities of implementing Basel III for the Nepalese banking system	Nepalese banking system	Descriptive	The key challenge was finding huge capital under Basel III
Bitar et al. (2014)	29 Countries	Looks at the effect of the Basel III administrative structure on the effectiveness of Islamic and traditional banks	514 conventional and 125 Islamic banks	DEA, conditional quantile regressions	Basel III necessities for higher capital and liquidity had a negative connection with the productivity of Islamic banks while monetary influence has a contrary impact
Kapoor and Kaur (2017)	India	Implementation of Basel norms: a review of the empirical literature	Theoretical	Review of Literature	Different levels of preparedness of banks in different countries, with different regard to Basel norms

(continued)

Table 10.1 (continued)

Author	Country	Research objectives	Sample	Methodology	Findings
El-Ansary and Hafez (2015)	Egypt	To look at logical victors that impact capital ampleness proportion (CAR) in the Egyptian business banks	36 Egyptian banks	Correlation and regression	Liquidity, size, and board quality are the huge factors to clarify the fluctuation of Egyptian banks' CAR
Vousinas (2015)	Greece	To study the new regulatory framework developed by Basel III		An analytical review of the existing literature	Basel III improves the bank's stability and regulations need to be up-to-date with innovation in the financial system
Al-Tamimi et al. (2016)	UAE	To assess the UAE banks' readiness for implementing Basel III	UAE banks	Descriptive, Regression analysis	UAE banks were fully aware of the advantages to be derived from the implementation of Basel III and were willing to implementation of same
Kozarević and Polić (2016)	Bosnia and Herzegovina	To talk about the genuine and potential impacts of Basel III in both created and developing economies with an accentuation on the banking segment of Bosnia and Herzegovina	12 Banking sector of Bosnia and Herzegovina	Descriptive	Supervisors have to do hard work and face many challenges on the road to the implementation of Basel III

Table 10.1 (continued)

Author	Country	Research objectives	Sample	Methodology	Findings
Maria and Georgoulea (2016)	Greece	Explore the impacts of the new liquidity and influence necessities under Basel III on the exhibition of Greek banks	19 commercial and cooperative banks	Correlation and regression	New influence necessities may compel banks to shed exceptionally fluid resources from their monetary record
Najam et al. (2017)	Pakistan	To evaluate the financial performance of Islamic and conventional banks of Pakistan under the umbrella of capital standard Basel accord III	Seventeen conventional and five Islamic banks	Descriptive	Both conventional and Islamic banks were performing better but could not fulfill and comply with the requirements of Basel accord III
Shukla (2017)	India	To contemplate the likely effect of Basel III usage for Indian banks	"20 private sector banks and 26 public sector bank"	Descriptive	Basel III Accord is successful in principle to shield the financial framework from monetary misfortunes; nonetheless, the genuine viability of Basel III execution can be investigated in its real usage

Table 10.1 (continued)

Author	Country	Research objectives	Sample	Methodology	Findings
Singh and Gupta (2017)	EU , Hong Kong, Singapore, USA, Australia, India	Concentrate dissect a similar situation of different systems received by singular Central banks and approach changes remembered for their fiscal strategy to execute the Basel III arrangements in a staged way	Central banks of various countries	Descriptive	The examination presumes that the created nations are moderately in an agreeable situation when contrasted with creating economies
Giordana and Schumacher (2017)	Luxembourg	Study how the Basel III regulations are likely to impact the Banks' profitabilities	Banks in Luxembourg	Econometric model, simulation	All banks would have seen a decrease in their default risk if they had previously followed Basel III norms
Maraghni (2017)	Tunisia	Impact of changes in capital ratio at risk-taking incentive for Tunisian banks	Ten Tunisian universal banks	Panel Regression	Regulatory pressure led to the adoption of capital adequacy requirements
Kapoor and Kaur (2017)	India	To analyze SWOT analysis of Basel III framework as well as to execute TOWS analysis	Indian banking sector	Theoretical	Smart alternative strategies were devised by Indian Banks to ensure effective implementation of Basel III resulting in the profitability of banks

Table 10.1 (continued)

Author	Country	Research objectives	Sample	Methodology	Findings
Ramlall and Mamode (2017)	Mauritius	The implementation of Basel III in the banks in Mauritius	Banking sector of Mauritius	Descriptive	Lack of data management, risk reporting systems, and IT were major challenges in the implementation of Base III
Njuguna and Kombo (2017)	Kenya	To investigate the significance of capital adequacy requirements in the Basel III framework for commercial banks in Kenya	159 management staff in 43 commercial banks	Descriptive survey method	Capital adequacy requirement was perceived to be significant in commercial banks
Boora and Jangra, (2018)	India	To explore the preparation level of Indian public sector banks for the implementation of Basel III	The senior managers and directors of 21 public sector banks	Descriptive, regression and correlation	The capital adequacy ratio of public sector banks is above 11% indicating willingness of banks for Basel III
Roulet (2018)	22 countries of Europe	To analyze the impact of Basel III requirements on bank lending post-2008 crises	269 banks in Europe	Regression analysis	The capital adequacy ratio of public sector banks is above 11% indicating the willingness of banks for Basel III
Zarafat and Prabhune (2018)	India	Investigating the internal and external factors affecting a bank's total risk	35 Indian Public and private sector banks	Multiple regression	capital and profitability influence risk factor of Indian public and private sector banks

insurance, reduced vulnerability to liquidity shocks impact the capital requirement of the commercial banks in Kenya under the Basel III framework (Njuguna and Kombo 2017). A negative association of Risk with capital and ROA and a positive association with ROE was reported.

10.6.3   Impact of Basel III Norms

Hypothetically, Basel III Accord was powerful to shield the financial framework from the financial misfortunes of 2007–2008. Nevertheless, the genuine viability of Basel III usage can be understood after its real execution (Shukla 2017). Administrative pressure impelled the adoption of capital adequacy requirement and capital did not recommend an abatement or an expansion in risk-taking and also that the legitimate and institutional mechanism shows a positive impact on the degree of the capital requirement (Maraghni 2017). New leverage necessities under Basel III may constrain Greek banks to shed profoundly liquid assets from their balance sheets, subsequently trading off with their capacity to supervise liquidity when under pressure (Maria and Georgoulea 2016). Both ordinary and Islamic banks were discovered performing better yet not satisfying and agreeing with the prerequisites of Tier I capital proportion of Basel accord III (Najam et al. 2017). Liquidity, size, management quality, assets quality, profitability, and risk were discovered as the most noteworthy factors that clarified the difference of Egyptian banks' Capital Adequacy Ratio (El-Ansary and Hafez 2015). Capital had critical and negative effects on European bank's' retail and other credit development while liquidity has positive yet, also, unreasonable consequences for bank credit development (Roulet 2018). Basel III's capacity to lessen systematic risk required nearer thought to counter all Basel II disadvantages and systematic risk, satisfactorily (Schwerter 2011). Basel III improves bank firmness yet adds load to banks' credit arrangements, he further added that it has to remain consistently state-of-the-art to attach with the current financial framework (Vousinas 2015).

10.6.4   Opportunities and Challenges

SWOT analysis and TOWS analysis of Basel III suggested that Indian banks had to accept Basel III to achieve harmonization with international standards. Investigation of challenges and opportunities for Myanmar financial system, concerning complying with the Basel I, II, and III accords, suggested the replacement of direct control with prudential supervision, strengthening of supervision, intensification of training and development for the staff, investment in IT infrastructure, enforcement of new capital and new liquidity requirements (Lwin 2013). Identifying the opportunity and

challenges of implementing the norms for the Nepalese economy, banks, and financial system, it was stated that the challenges in execution of these regulations were mainly the poor management information system along with incompetent human resource (Uprety 2013).

10.7   Discussion

10.7.1   Sample and Respondents

Primary sources of data were collected in most of the studies that were reviewed in the present review article. The data were collected from the respondents with the help of mail surveys, questionnaires, and interviews. However, secondary sources of data were also used by some of the studies. In most of the studies, management staff, senior bank managers, and directors were mainly targeted as respondents.

10.7.2   Variables Analyzed

Many variables like awareness of Basel III, implementation cost, infrastructure readiness, capital adequacy, level of skill, quality of human resources, training, technological level, disclosure requirements, risk reporting and monitoring were studied by different researchers. Variables affecting the implementation of Basel III norms in banks as well as the impact of Basel III norms and major challenges in its execution were enumerated by the studies.

10.7.3   Research Methodology

Descriptive and inferential statistics were used by the researcher to show the results of the studies. Descriptive statistics were used by many studies to analyze the execution of these regulations in Basel III norms. However, regression analysis was used by many studies while examining the effects of these regulations in Basel III on risk, bank advances, and bank performance. DEA was used by a few studies to show the efficiency of the banks. Other tools used by researchers were t-test, correlation, meta-analysis, etc.

10.8 Important Trends

Many important trends were revealed from the reviewed studies. Banks were found adopting the regulations under Basel III. Some of the countries still keep on struggling to meet the requirements of the accords. Many countries have successfully adopted Basel III norms in their respective banking system while some are ready to implement the requirements. However, many banks all over the world are facing challenges in the execution of the norms as it requires considerable resources in the form of capital, skilled staff, reporting, infrastructure, etc.

Studies like Boora and Jangra (2018), Santhi (2014), Al-Tamimi et al. (2016), Ramlall and Mamode (2017) investigated readiness and implementation of Basel III norms. Boora and Jangra (2018) found adequate capital requirements with banks in the public sector of India to follow immediate capital adequacy requirements. Al-Tamimi et al. (2016) indicated that UAE banks were willing to execute these regulations under Basel III norms as they had enough assets and efficient management. Shamsuddin (2013) reported that Malaysian banks were well-positioned to adopt the proposals without significant difficulties. Ramlall and Mamode (2017) found Mauritian banks had enough financial resources and the implementation of Basel III would ensure financial stability. According to Maraghni (2017), regulatory pressure led to the adoption of the capital adequacy requirement. However, many countries had not complied with Basel III requirements as Najam et al. (2017) showed that Pakistan's conventional and Islamic banks were performing better but could not comply with the requirements of the Tier I capital ratio of Basel III. According to Boora and Jangra (2018), Indian banks had the required assets for the proper execution of regulations under Basel III. Al-Tamimi et al. (2016) reported that UAE banks have the required assets and trained managers, which is the most important factor of Basel III implementation. Ljubic (2015) showed that effective implantation of Basel III norms was ensured in Serbia leading to strengthening the risk management framework to a great extent.

Numerous studies featured the difficulties of actualizing Basel III standards. Boora and Jangra (2018) announced that Indian banks knew about the significant expense connected with Basel III usage. As indicated by Mirchandani and Rathore (2013), the complete execution of Basel III in Indian PSU banks in the next 6 years will be an additional testing assignment. Ramlall and Mamode (2017) indicated that in Mauritian banks, the difficulties of execution of Basel III were, absence of information from the executives, risk detailing frameworks, and IT. As indicated by Vousinas (2015), Basel III improves bank strength yet adds additional weight to banks influencing credit strategies. Uprety (2013) detailed that for the Nepalese financial framework, the key test is the enormous capital prerequisite under Basel III, a shortcoming in the board data framework and unable Human Resource. As per Kozarević and Polić (2016), supervisors are yet to do a ton of work and face numerous difficulties headed straight toward the usage of Basel II or Basel III. Boora and Jangra (2018) argued that the mindfulness level of Indian banks' supervisors was satisfactory concerning Basel III.

Roulet (2018), Shukla (2017), Maraghni (2017), Fidrmuc and Lind (2018), and Giordana and Schumacher (2017) analyzed the effect of Basel III standards on banking execution. As indicated by Sanders (2015), American banks would be less affected than outside banks and American mid-traded on open market banks were at that point all around promoted. Nucu (2011) found that there would not be an effect of Basel III on the Romanian financial framework. In another investigation, Roulet (2018) indicated that capital proportions had a huge and adverse effect on enormous European banks' retail and other loaning development. As per Shukla (2017), Basel III Accord was very huge in shielding the financial framework from money-related issues. Giordana and Schumacher (2017) demonstrated that all banks would have experienced a decrease in their default risk as they had recently followed Basel III. Maraghni (2017), did not recommend a decline or increment in the risk-taking mentality of banks. Maria and Georgoulea (2016) anticipated that new influence prerequisites might apply pressure on banks to shed exceptionally fluid resources from their accounting reports. As per Bitar et al. (2014), Basel III prerequisites for liquidity and higher capital are contrarily connected with the productivity of Islamic banks. Roy (2013) accepted that Basel III is relied upon to give an increasingly steady financial framework and help Indian banks to contend all-inclusive through improved risk-mitigating frameworks. Kapoor and Kaur (2017) featured the benefits of Basel III standards to banks in India, for example, administration of hazard and portfolios, compelling supervision, more straightforwardness in activities, more hazard affectability, and adjusted hazard returns.

10.9 Conclusion

The present study concentrated on writing accessible on readiness and usage, opportunities and difficulties, and effects of Basel III standards as suggested by the BCBS under BIS. Basel III was presented in 2010 as a reaction to the money-related emergency of 2007–2008 and the different inadequacies of Basel II. Basel III is relied upon to make the banking framework increasingly steady and flexible to financial emergencies. Diverse economies like India, UAE, Malaysia, and Mauritius were prepared for executing Basel III standards. A few nations like Serbia had effectively actualized Basel III standards. In any case, banks in nations like Pakistan still could not consent to Basel III prerequisites. A survey of studies demonstrated that banks know about the advantages of Basel III. Banks in numerous nations like India and UAE have adequate resources and prepared staff, which are the most significant components to consent to Basel III. In any case, the execution of Basel III would be a difficult assignment for the banks, as it would require colossal capital, prepared staff, and improved IT structure. Execution of Basel III would expand government obtaining and may abridge the accessibility of bank credit. It would improve bank soundness yet would add additional weight to banks influencing their credit strategies. The correct execution of Basel III would make the financial framework increasingly straightforward.

10.10 Recommendations of the Study

Based on the above discussion, the accompanying suggestions can be made.

- More studies can be completed to analyze the readiness of banks for Basel III standards in various nations.
- Studies can be completed to evaluate the effect of Basel III on the execution and loaning conduct of banks.
- Studies ought to be directed examining the usage of credit risk, supervisory survey, and market discipline by the banks.
- Execution of Basel III ought to be checked by the controller to guarantee the consistency of saving money with Basel III.
- Regulators ought to give important serves to the banks for the usage of Basel III standards.
- Banks ought to build up their IT framework and train the staff to wade through evolving guidelines.
- Execution of Basel III requires immense capital, Government and controllers ought to give money-related help to the bank to agree to the requirement.

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Chapter 11
The Role of International Tax Accounting in Assessing Digital and Virtual Tax Issues

Hesham Zakaria

Abstract Tax accounting depends on many aspects, dimensions, and constituents that interact together in order to achieve its main goal, which is to reach the determination of the profit or the tax base on which the tax is imposed according to the laws, legislation, and regulations that govern this, and in light of the aspects of tax accounting. Shortcomings related to its current, non-renewable nature and development, the matter called for many scientific and practical opinions dealing with the need to develop and improve the performance of tax accounting to become more appropriate and capable of dealing with changes and developments as well as reducing the deficiencies faced, and then the general agreement between many of those. The views are that tax compatibility and standardization of procedures are achieved in a scientific framework, followed by access to international tax accounting, as one of the most important modern trends that the requirements for achieving international tax harmonization and unification on the one hand have called for, and also as a start toward issuing and building accounting standards directly directed to tax accounting as one of the attempts Overcoming the tax gap between financial accounting and tax accounting, not only as developing current tax accounting to make it relevant. A modern approach, rather working to make it with an international dimension that takes into account the international requirements of tax systems in light of the international problems and issues facing those tax systems, and this is what can be achieved through international tax accounting, specifically when it comes to virtual and digital tax issues.

Keyword International tax accounting · Electronic commerce · Crypto currencies · Electronic advertising

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11.1   Introduction

Accounting audit is a science of renewed science constantly under the shadow, and that in light of the science's endeavor to keep pace with the various variables and factors that the business environment is experiencing. As electronic and digital transactions come in as one of the most important of these problems in the absence of the tangible physical side for Accounting documents, and as a result, many academics and researchers have sought to recommend the use of Artificial Intelligence of its various types and methods to help Accounting Audit in those electronic and digital transactions, which led to the emergence of the so-called E-Accounting Audit, which is the most modern aspect of keeping up with computerized or electronic Accounting Information Systems in the widespread use of computers to complete the Accounting work, such as recording, tabulating, posting, summarizing, and reporting, and therefore the performance of E- Audit will differ greatly from the usual Traditional Accounting Audit, especially after what the world witnesses of the spread of the COVID-19 pandemic, to identify the nature of the use of AI in accounting audit, the following will be addressed:

11.2   What Is International Tax Accounting?

The lack of a clear definition of international tax accounting increases the shortcomings of the current tax accounting in the face of international tax problems and issues, although many professional opinions have confused tax accounting with international tax accounting, including the application of accounting through the legal and legislative side while ignoring the accounting role and reducing its role. In providing information to all parties concerned with the domestic and international tax system, as some defined international tax accounting from the perspective of achieving international tax compliance, as a branch of accounting that aims to collect and analyze data that enables the enumeration of the taxpayers and taxpayers within the tax community and work to measure the transactions of the financiers and taxpayers Within the tax community and access to achieving measurement (Al Karaawy and Al Baaj 2018, p. 8), however, this definition was only limited to preparing local tax accounting for international dealings without explaining the international dimension of tax accounting as a tool to achieve the exchange of tax information between all parties in the tax system, locally and internationally. Which invited the student to explain what international tax accounting is from during the following:-

11.2.1   Definition of International Tax Accounting

It is considered as a branch of accounting that is concerned with providing tax accounting information capable of achieving mutual interaction between local tax systems, and the different and varied international tax systems in a way that reduces differences and discrepancies in the number of businesses at the international level, as it is tantamount to reconfiguring the business number that has been disclosed. At the level of the partial and national accounting unit, and the delivery and exchange of domestic tax accounting information between international tax systems, in a way that works to achieve comparability and evaluate tax performance in an accounting manner, and to overcome inaccurate indicators and measures of international tax competition, and also to achieve the possibility of international tax standardization between different tax systems Therefore, tax accounting according to this definition includes a set of characteristics that are represented in the following:-

(a)   It is a branch of accounting, which depends on all the accounting rules, principles, and assumptions defined by the science of accounting that can be relied upon in building the conceptual framework for international tax accounting, considering the integration of its concepts and objectives as a sub-science stemming from the science of financial accounting.

(b)   It works as a means of linking both the local tax system with the international tax system, through that the local side takes into account the configuration of the tax accounting information provided by the partial accounting unit, whether they are natural or legal persons, various types of taxes imposed on them, in order to reach that the local tax system extends the system. The international community needs its own needs, and then leads to achieving a balance between inputs and outputs, counting amounts or information not reported at the international level, and identifying the reasons for that.

(c)   It is a tax accounting information system that depends on the interconnectedness and interaction of all international tax systems through a statement of accounting information prepared in accordance with the principles and rules of generally accepted accounting, provided that the amounts such as exemptions, exceptions, and others that are determined by law and tax legislation are shown as a separate item or as an element in the financial statements with reference to it By disclosing it in accordance with the law or legislation regulating it.

(d)   It works to add new components to the current tax accounting, which are indicators and measures at the level of the entire tax system, starting from the accounting unit and passing through the tax administration to the level of the overall accounting unit (the state), where these indicators and measures contribute to providing financial information. And quantitative and statistical, on a continuous, periodic basis, that fulfills the requirements of all the tax system at the local and international levels, without prejudice to the needs of any of them.

11.2.2   The Importance of International Tax Accounting

The importance of international tax accounting can be determined through the following:-

(a)   It works to improve the local tax system and make it internationally oriented by preparing it to accommodate dealing with international tax issues and problems such as international tax evasion, domestic and international double taxation, difficulties in achieving tax compatibility, and the negative effects of tax competition.

(b)   It provides a set of indicators and measures that can be relied upon in the current tax accounting as an entry point toward developing the latter in preparing tax accounting information to achieve the requirements of information exchange for international tax purposes, with the possibility of comparison between international tax systems without having a difference in preparing tax accounting information.

(c)   It is considered an improvement in the performance of the current tax accounting in light of linking the local business environment, i.e., linking the state's local tax systems with their counterparts at the international level, which in turn contributes to overcoming the deficiency of current accounting information, given that international tax accounting is an information system that starts from the funder on the scale local through to international or global scale.

11.2.3   Limits of International Tax Accounting

(a)   It provides an improved model for the current tax accounting in terms of overcoming its limits in dealing with the international dimension of tax information. However, it faces obstacles represented in the following:-

(b)   Laws and legislations, the legal and legislative system in any country is the basis for application in institutions and companies in countries, and therefore, in light of the different legal and legislative environment, it stands an obstacle in the application of international tax accounting, which requires that many measures be taken to achieve compatibility in tax laws and legislation, even if. This finds it difficult, but there are many international economic unions that have reached work on unifying the tax system to become an international system that takes into account the needs of the members of the International Federation.

(c)   The rules and procedures for imposing taxes, the financial statements are the main pillar on which to take the necessary measures to impose taxes, and then the relationship between each of the accounting procedures and the tax procedures testifies that accounting practices are taken in accordance with accounting standards to reduce the accounting income that may be rejected or dealt with by the tax procedures to increase Taxable income, and this requires that there be independent tax accounting standards to standardize those procedures.

(d)   Sources of financing and the financial system, one of the most important sources of financing for the financial system is tax resources, and then the tax procedures are limited to what is contained in laws and legislation in light of a gap between accounting and taxes, which in turn leads to the loss of the value of tax accounting information for the possibility of its delivery at the international level because it is originally based on the law The organizer of the tax work and considering that accounting is nothing but a means of access to taxable income, which may lead only to clarification of sources of financing between the difference between each of them.

(e)   The rate of economic inflation, many countries suffer from different levels of economic inflation, which leads to those countries and their financial institutions follow accounting methods and practices at the local and national level to address the negative effects of financial reporting, which require an adjustment to the use of the historical cost principle. Thus, this discrepancy is consistent with international tax accounting.

(f)   Political and economic relations, the common factor between all countries, despite the differences in political and economic terms, are the science of accounting, which is seen as a technology that can be used to provide accounting information that serves all international goals and fields, and therefore following the generally accepted accounting principles is no longer a goal. As far as the appropriateness of what this provides for the economic and political aspects, the international tax accounting must take into account to achieve independence on its own in order to achieve these relationships.

(g)   The degree of relationship between environmental factors, there is a correlative and complementary relationship between the factors affecting the tax system, the financial system, the legal system, the political system, etc. Similar systems, and that in the event of conflict between the local systems, it is difficult to achieve the requirements of international tax accounting.

11.3 Motives and Justifications for the Need for International Tax Accounting

The justifications for the need for international tax accounting are as follows:-

(a)   The increasing interest of local and international bodies and organizations behind the need to achieve tax compatibility, standardization, and harmonization at both the local and international levels in terms of tax accounting methods, methods and procedures, which allows facilitating the process of exchanging information for tax purposes and understanding the nature of tax accounting information at both the local and international levels.

(b)   The emergence of tax problems on the international scale because of the increase in transactions, the volume of international trade and international investments, in addition to the emergence of multinational companies and the

expansion of their scope, which led to the necessity of preparing the current tax accounting to accommodate these international factors.

(c) The increasing interest of investors, institutions, unions, and economic blocs in all countries about the necessity of an international tax system, which in turn requires the need to develop tax accounting to accommodate the international dimension, which in turn leads to compatibility with international requirements, conditions and factors to keep pace with the development of tax accounting.

11.4 Elements of International Tax Accounting

It depends on a set of elements that work together in reaching a conceptual framework for international tax accounting, as it is represented by:-

(a) **The Objectives of International Tax Accounting**: accounting science in general works to provide information that helps rationalize the decision-making process, and considering that international tax accounting is a branch of accounting that works to lay the foundations for standardization and harmonization of accounting principles and rules at the international level, the objectives of international tax accounting.

    i. Establishing a theoretical and scientific framework that organizes and governs tax accounting practices and reports at an international level, helping to reach the derivation of a practical and applied framework, as well as providing a set of guidelines and directives for local tax accounting, which in turn serve the tax orientation at the international level.

    ii. Studying and analyzing tax systems in different countries to arrive at the tax accounting system that is most appropriate to the needs of those countries, and what entails providing a tax accounting treatment and tax accounting information that in turn achieves exchange for tax purposes that serve local and international tax systems.

    iii. Establishing international tax accounting principles and rules that can be used to develop local tax accounting systems, in light of the latest trend among countries in issuing an international tax law to eliminate international tax phenomena and issues, which requires the need for international tax accounting to interact with this law.

    iv. It works to provide tax accounting information that helps local and international financial and supervisory institutions in identifying the extent of the impact of local tax systems in developing the economies of international companies or the economies of their subordinate countries.

    v. It works to achieve consistency in local and international tax accounting practices, standardize tax accounting procedures in preparing tax

accounting information to facilitate the comparison process, while facilitating tax review and increasing confidence in tax accounting information at the local and international levels.

vi.   It works to reduce the differences in tax accounting information presented by the financial reports of international companies of all kinds, while helping all parties in the tax system to understand the nature of that tax information, whether they are related to the local or international level.

(b)   **The characteristics of the international tax accounting information**. The characteristics of the IASB 2015 conceptual framework for financial accounting can be used to define and describe the characteristics of the accounting information (IFRS 2018), in addition to adding other characteristics that achieve the international dimension. The following are presented as follows:-

i.   The suitability characteristic, represented in the ability of tax accounting information to make a change in the direction of its users' decisions, as it includes basic conditions such as forecasting future conditions and potential and expected results in future periods, and achieving a degree of certainty and realism about the events, transactions, and processes expressed, as well as its relative importance. What influences the decisions of all users, locally and internationally.

ii.   The characteristic of sincere representation is that the tax accounting information provided to all parties to the tax system at both the local or international level correctly expresses the true, complete, incomplete, and objective events contained in it far from expressing the opinions or views of the information preparers, as they represent These conditions fulfill this characteristic of the accounting tax information.

iii. The enhancing characteristics of accounting information represent the additional level of the characteristics of the tax accounting information that achieve balance and equality in effect between the appropriate basic characteristics and honest representation, thus giving a high degree that is reflected in the decision-making process by users of tax accounting information in the various tax system, and these characteristics include in (IASB, 2015):-

      • The characteristic of comparability, which is considered the beginning of the work of international tax accounting through making comparisons between international tax systems, according to which comparison between similar and similar tax accounting information according to the same principles of preparation and following the same preparation procedures as it is required that it be prepared according to the same methods, methods and accounting standards which I helped prepare.

      • Appropriate timing feature, intended to provide tax accounting information at a suitable time preceding the decision-making process in

sufficient time to ensure that users of tax accounting information can be approved by various parties of the tax system for information provided to them in a sufficient time to properly rationalize their decisions.

- The verifiable property means the availability of evidence and documents supporting the occurrence of tax transactions and operations that resulted in tax accounting information. When such evidence and documents are available, the same results will be reached without interference from the information prepared.
- The comprehensibility characteristic, represented in the availability of information in a simple manner without complication and understanding by its users without occurring confusion in the results provided to all parties in the tax system, and thus it is considered a trend toward standardization of concepts to reach the standardization of international tax accounting information at both the local and international levels.

(c) Restrictions on Tax Accounting Information, represented in one limitation, which is the cost and benefit of tax accounting information, where the quality of tax accounting information and its reliability are evaluated if the benefit from the information provided exceeds the cost of preparing that information.

(d) New characteristics for assessing tax accounting information. The relationship between international tax systems and the evaluation of accounting information can be relied upon in terms of flexibility and the extent of response to tax issues locally and internationally, in reaching new features, which are as follows:-

- The flexibility characteristic of tax accounting information depends on that tax accounting information achieves flexibility in dealing with tax issues and problems through the variables and factors affecting tax systems and the tax information it provides among countries.
- The characteristic of the interdependent relationship between international tax systems depends on showing the interconnectedness between international tax systems through that the tax system of a country considers what it provides of accounting information that in turn represents inputs to an interconnected international tax system among all tax systems, so that the interaction between them achieves reciprocal purposes. For tax information between those systems.
- The feature of unifying tax information, this feature depends on the fact that working on standardizing tax accounting information will help in achieving local and international tax accounting requirements in providing instructions and directions that do not differ from one tax system to another, but on the contrary, the possibility of achieving all the basic and promotional characteristics of tax accounting information within agreed limits.

(e) **Concepts of International Tax Accounting**: the science of accounting depends on many concepts that explain the identity of the items and how

to deal with them, as well as the elements included in the financial statements and reports, and considering that international tax accounting is a modern field in dealing with tax issues locally and internationally, it includes a set of concepts and definitions that They are represented in the following in addition to the other accounting concepts found in the IASB 2015 Financial Accounting Conceptual Framework, which are as follows:-

i.   The local tax community is represented in starting the adopted tax policy and the various balanced and clear objectives associated with it by each of the parties to the tax system at the local level, which is the accounting unit (legal or natural persons), tax administration, and the overall accounting unit (i.e., the state), and a statement of the role Tax accounting at the local level in converting what is contained in the local tax community into information directed to the international external level.

ii.   The international tax community is the wave information required by the international tax system and received by the local tax community, which requires that the tax accounting information be prepared in a manner that achieves both the local and international tax community's understanding of tax accounting information (OECD 2018, p. 13).

iii.   Electronic tax, or BIT tax, is one of the proposed solutions for organizing transactions involving the electronic transmission of data and information, and it is collected on the basis of the amount of digital data and information that is transferred or used, and it should be noted that in light of the increase in electronic transactions, the matter calls for its inclusion within the international tax accounting.

iv.   International exchange of tax information, which is the method, method, or means by which tax accounting information is provided locally and internationally, as it starts from receiving tax accounting information at the state level according to detailed national reports that clarify the objectives that the tax system seeks to achieve, and the delivery of that information to the international level for assessing the domestic tax system and explaining how to deal with international tax issues (EY, 2017, p. 4).

v.   Tax pressure, represented in the tax effort borne by society in the form of taxes or the amount that it exploited from the tax energy of society, which in turn is represented in the tax revenues actually collected (i.e., the actual tax burden) to the national product or national income, to be clarified according to the mathematical equation (tax pressure = Community tax burden divided by tax energy) (Vintila and Ţibulca 2014, p. 5).

vi.   Tax transparency, represented in the mechanism of providing tax accounting information such as tax policy, tax strategy, and tax governance, as it is seen as achieving one of the most important accounting steps, which is tax disclosure, which includes providing

accounting information directed to the parties involved in decision-making (OECD 2019, p. 12), and if this has been applied with international tax accounting, tax transparency is an alternative to tax accounting disclosure according to those steps and aspects.

vii. Tax revenues are the tax resources collected by the state from both natural and legal persons according to what the tax system specifies that the transaction is subject to tax, whether it is direct taxes or indirect taxes, and tax revenues are considered at the same time a burden on the financiers.

viii. Tax expenditures, represented in the costs and burdens that are deductible, excluded and excluded from revenues to reach taxable income, and those items and elements are determined according to what is determined and determined by the tax system, and accounting standards are considered as guidance or guidance for how to deal with these items and elements if they are in compliance with laws And prevailing tax legislation.

ix. Deferred tax assets are the value of taxes that are due to be recovered in future periods (i.e., lead to a reduction in taxable income in those future years), as this reduction in taxes that will be payable in future is the result of the deducted temporary differences.

x. Deferred tax liabilities are the value of taxes that are due to be paid in future periods (that is, lead to an increase in taxable income in those future years), as this increase in taxes due in future results from the deducted temporary differences.

xi. The profit and the tax base is the profit (or loss) on which the taxes payable is imposed, where the rules for imposing the tax differ according to the circumstances and factors of the tax event established and determined by the laws and legislations.

xii. The informal economy is represented in all activities and transactions that are difficult for the legal authorities in the state to enumerate, as they operate through two aspects, the first: activities that generate revenues by legitimate means, but what is achieved from the revenues and resources of these activities are not shown and explained to the tax administration, such as private lessons and other Activities (Efendic et al. 2018, p. 78). As for the other side: for the informal economy, activities generate revenues through illegal means, as what is achieved from the revenues of these activities is carried out by means in violation of the prevailing laws and legislations (OECD 2019, p. 9), Hence, the first perspective is considered as transfers between sectors, while the other perspective is a leakage of national income and national output.

(f) **The indicators and measures of international tax accounting** represent tools on which the accounting model in its various branches depends on providing additional accounting information, and given the current tax accounting shortcomings in its lack of such indicators and measures, the matter requires that it

be included in international tax accounting as part of its components, in order to provide reliable information. In assessing tax systems locally and internationally, the following are the indicators and measures presented through the following (Akol et.al. 2019, p):-

i.   **Indicators and measures at the level of the partial accounting unit (or financiers)**, that group is linked to all the indicators and measures that can be relied upon by the partial accounting unit represented by natural and legal persons, as the tax represents an obligatory burden it should bear to ensure the state's right, and the following is an overview of a set of indicators And the metrics associated with this party to the tax system.

- The unit revenue index for the sector, showing the percentage of the accounting unit's revenue for the sector before excluding tax exemptions and incentives for this sector, and a statement of the total revenue of the sector as a whole that the unit practices.
- The index of unit costs and expenses for the sector, showing the revenue costs and expenses without the tax burden (whether direct or indirect taxes) borne by the accounting unit to achieve the operating income of this sector with a statement of the total burdens of the sector in which the unit practices, indicated by the tax administration.
- The incentive and tax incentives index for the unit shows the amounts that the partial accounting unit benefits to carry out its activity, whether it is for the purpose of granting them as incentives to encourage investment in the sector or as an incentive to pay back tax dues, and the amounts are considered part of the revenues of the accounting unit that is not subject to tax.
- The tax burden indicator of the sub-unit, showing the tax burden of the accounting unit by classifying it according to the type of taxes, whether direct or indirect, to the total tax resources realized from the sector in which the sub-unit operates in, with the aim of measuring the tax burden of the sub-unit.

ii.   **Indicators and measures at the level of the tax administration** (or tax authority), which evaluates the performance of the tax administration, which represents the control and tax review as an intermediary party between the partial accounting unit (taxpayers or taxpayers) and the overall accounting unit (the state), and the following is a presentation of those indicators and measures as follows:-

- Indicators of tax collection and financing, working to achieve the objectives of the tax system, the development of the collection process, the collection of fines and exceptions approved by the tax system, in addition to the clear identification of tax resources that work to finance the state budget to reduce the rates of deficit and public debt and increase resources by expanding the tax revenue base and linking

them In economic activity, with an indication of the role of the tax system in the economy and the redistribution of income in terms of both tax collection or tax financing.

- An indicator for measuring the growth of tax revenues (resources), which measures the percentage of tax revenue growth with both gross domestic product and national income.
- Tax control and examination index, which evaluates the performance of the tax administration and demonstrates its ability to follow the tax accounting process through its various stages.
- The tax privileges index is to show the size of the tax benefits and benefits provided to financiers, which are considered a deductible part of the tax resources.

iii. **Indicators and measures at the level of the total accounting unit** (or country), that can be relied upon by the overall accounting unit represented in the country that provides information for tax purposes in exchange for obtaining similar information from other countries in order to achieve the possibility of interconnection between systems, comparison between them and limiting appearances. Other, such as competition, duplication, and tax evasion at the international level, and the following is a presentation of a set of indicators and measures associated with this part of the tax system.

- Taxpayer base index, which provides accurate and documented information about taxpayers, and develops a database of potential taxpayers.
- An index of tax awareness, based on it to indicate the trends and behavior of taxpayers or taxpayers.
- Through what is reflected in determining the type of tax, whether direct or indirect, with determining the actual number of those subject to tax in the tax community, and varies according to the nature of the tax return if it is monthly, annual or modified, it contributes to determining the degree of tax awareness and the possibility of achieving tax follow-up.
- Indicators of dispute and tax litigation, working to define independent procedures for resolving disputes, and indicating the time taken to resolve disputes and the results of tax dispute resolution.
- The index of effective tax risk management, which works to identify the risks of non-compliance, evaluate them and classify the risks with a quantitative assessment of these risks, and work to reduce the risks by developing a plan to improve tax compliance, and monitoring the performance of the state to reduce the risks of institutional non-compliance.
- Voluntary Tax Compliance Index, the index determines the scope, timeliness, and accessibility of tax information, as well as neutralizes

taxpayer compliance costs, and tracks taxpayers' opinions on local tax services.

- The index of efficiency in tax revenue management works to contribute to providing forecasts of tax revenues (government resources from taxes), with an assessment of the adequacy of the current tax accounting system to international requirements, and tax refund procedures.
- Accountability and Transparency Index, which aims to clarify the internal guarantee mechanisms, external supervision of the local tax administration and follow up on the actual and targeted results provided by the tax administration with integrity.

(g) Parties and groups benefiting from tax information, international tax accounting provides a set of information for various purposes, not just tax, but extends to include various economic, social, political, and environmental purposes at the international and local levels, through the following different groups and parties:

i. The beneficiaries at the local level, represented by all users of tax accounting information from the partial accounting unit, and they are both potential and current investors (project owners), suppliers, or creditors, lenders from financial and banking institutions, customers, as well as all other users represented in the local tax administration (Tax Authority), in addition to local professional and practical organizations such as trade unions, trade unions, civil societies, the public and citizens, chambers of commerce and industry, and government authorities.

ii. The beneficiaries at the international level, represented by all users of tax accounting information from the total accounting unit (the state), and they are all from the various international economic sectors, professional and scientific organizations concerned with developing the tax accounting field, international tax accountants, and the international tax administration (which is an administration that works on receive information from local administrations, analyze and formulate it for use on the international level), international financiers and commissioners (from multinational companies).

(h) The International tax accounting requirements, achieving international tax accounting depends on several requirements, which are as follows:

i. Following the cloud computing in the tax field because of its ability to link inputs and outputs through a group of electronic smart parties that operate through independent and interconnected databases according to a set of determinants, allowing each party to deal with the other according to clear and specific boundaries.

ii.   Adopting a business-intelligence approach in counting tax transactions for all sectors in the country, allowing information to be provided for international tax purposes.

iii. Moving toward the application of electronic collection, payment, and electronic payment for all transactions, whether tax or financial, starting from the lowest local levels up to the international level, as this helps in the possibility of counting tax transactions with values in a more accurate, appropriate, and timely manner to deliver accounting information to all different and varied parties in the system tax.

iv.   Linking local tax administrations internationally by establishing an independent international tax entity to receive tax information and analyze it according to its relative importance to overcome international tax problems and issues, so that it receives a summary and summary of the transactions for which taxes are due from the local level and delivers it according to legitimate channels for all parties concerned with international tax accounting.

v.   Take into account the expansion toward the formation of economic unions based on a common currency between them, similar to what the European Union countries have done, as it helps to overcome many accounting problems associated with changes in exchange rates and the translation of financial statements, which will benefit users of financial reports of all categories.

vi.   Preparing the so-called tax map, which is represented in the integration of international tax systems not at the level of a single country, but at the level of merging between economic unions according to the similarity in terms of economic, political, social, financial, and other conditions, and this would lead to confronting the negative effects of tax competition.

vii. Adopting international claims to issue an international tax law that defines tax accounting procedures and is not limited to multinational companies only, but includes local companies in the country to work on unifying the tax procedures without prejudice to the independence of the objectives of the tax system for any country in accordance with this international tax law.

11.5   International Tax Issues

Domestic and international tax thinking is witnessing many issues resulting from the development of the new electronic transactions that are no less important than evasion, double taxation, and other tax issues, due to the absence of a tangible physical form for those transactions and transactions and the lack of dependence on the traditional form of the exchange process, whether the transaction is a commodity or a service, and from examples of these electronic transactions are

e-commerce, Blockchain transactions, virtual electronic currencies (Bitcoin), and digital advertising, and the following is a presentation of each of them.

1. E-commerce transactions are known as one of the modern methods of trading, executing, and completing transactions and exchanges for goods and services, whether those are in their traditional form (i.e., goods and services) or in their digital form such as programs, consultations, services, and other activities via the Internet, so it raises many challenges to tax systems. Local and international transactions, as these transactions that took place over the Internet, are considered one of the most important tax issues that are no less important than other issues such as tax evasion and double taxation, due to the absence of a tangible physical form of those transactions and transactions that are most often carried out on social media sites in terms of providing services and consultations. And the conclusion of commodity exchange deals (Scarle et.al. 2012, p. 5), and therefore these transactions increase the transactions of the informal economy and ignore a large part of the possibility of obtaining resources and tax revenues for the state and the failure to achieve tax justice on the rest of the other tax-obligated entities that carry out their activities the different aspects of the formal economy umbrella.

2. Blockchain transactions are considered one of the most important technologies developed in Internet transactions, as they pave the way for the emergence of an increase in informal economy transactions, and also the development of information and data exchange for all different fields, whether commercial, financial, economic, or other, without the need for an intermediary between each of the parties to the electronic transaction and thus its nature can be determined as follows:-

   (a) **The emergence of Blockchain**, its beginning is in 1989 when Leslie Lamport developed electronic forms for electronic documents approved and signed between all parties in the transaction or transaction, while ensuring the confidentiality, safety, speed of registration, and protection of the information and data contained in those documents and forms that are limited to its parties only without the need for the intervention of a third party. In 1991, the practical and applied implementation of these electronic models was carried out with the emergence of electronic or virtual cash, which is considered one of the applications of the Blockchain.

   (b) **The concept of Blockchain**, this technology is known as a digital system that works on sequentially electronically exchanging information between many parties benefiting from those transactions and transactions without allowing only these parties to view and deal with the information and data available on the Blockchain, which is considered as a chain of trust that depends on the availability of conditions, It is a mechanism without interference or tracking by intermediary or third parties, and then this technology depends on it being a decentralized business network, so that one party does not affect the rest of the other parties, and it is a secret method of work that depends on trust between all parties to the chain

(Marwala and Xing 2018, p. 2), in addition to it being a digital ledger system that relies on recording, classifying, summarizing, and reporting all information between the parties to the transactions and transactions and reviewing them when needed without disclosing or presenting them to other parties other than the authorized dealers.

(c) **How Blockchain works**, this technology depends on six basic steps, starting with the first step by sending money or the subject of the deal (transaction) to the other party, then the second step, which is to consider the transaction as a closed block, followed by the third step to transfer the block to each node in the network, and the step. The fourth is the approval of specialists on the transaction according to specific conditions between the parties to the transaction, then the fifth step is to add the transaction to the Blockchain, and finally the sixth and final step, which ends with the receipt of the other party to the funds or the subject of the transaction (Swan 2019, p. 10).

(d) Blockchain types, classified into two types, the first: it is an open and public system that accommodates all interested parties interested in the transaction, while the second is a closed system that is specific to only the parties specified in the terms of the transaction or deal, so the second: it may increase the transactions and transactions of the informal economy. With regard to e-commerce transactions, however, they differ in that in recent times many solutions to the problems of e-commerce have been developed. As for Blockchain, it is an advanced technology whose problems are sought to be addressed (Dylanyaga et al. 2018, p. 45).

3. Electronic or cryptocurrency currencies, there are many electronic or cryptocurrencies, the most important of which are Bitcoin, Ripple, Dashe, Zcash, Litection, Monero, and Ethereum, the most famous of which are Bitcoin in transactions, which in turn leads to the absence of a tangible physical form of the deal or transaction, and the prevalence of electronic dealing or Digital is between a group of specific parties with terms and characteristics determined by the transaction or the deal between them (Shapiro 2019, p. 70), and thus the nature of Bitcoin can be determined as follows:-

(a) The birth of Bitcoin, it is one of the applications and methods that depend on the Blockchain, it was developed in 2007–2009 according to the electronic peer-to-peer cash system (Peer To Peer) under the pseudonym Satoshi Nakamoto, and therefore it is a non-governmental currency that uses a non-governmental payment system. It relies on the Internet differently from traditional cash payment systems (Narayanan et al. 2016, p. x).

(b) Concept—Bitcoin is one of the forms of electronic and encrypted cryptocurrency currencies, it is an electronic or virtual (digital) currency not issued by a central bank or central or governmental authority, which is exchanged and traded in a non-physical electronic form over the Internet,

making it easy to access and terminate. The completion of electronic transactions and transactions is limited to specific parties with knowledge of the conditions between them only (Mobert 2018, p. 3), as it is a decentralized system that is not subject to control except through the parties to the transaction without an intermediary.

(c) How Bitcoin works, this technology works through several stages, starting with sending a transfer message, which is an email message via the Blockchain with the subject of the deal, transaction, or Bitcoin exchange, and that transaction is irrevocable and cannot be canceled, and then the other stage is to create a special code for the virtual currency or Bitcoin, which represents the value of the currency in circulation between the two parties, the seller and the buyer, and the third stage is to determine the person or who obtains the virtual currency or Bitcoin, which in turn is transferred to an electronic wallet with virtual currencies within Blockchain (Guegan 2018, p. 2).

(d) Bitcoin's characteristics and characteristics, characterized by several characteristics and features that make it different from the traditional form of currencies, and that it works to confidentiality and protection of both the transacting parties (anonymity of the user) and funds, and it works on an unlimited scale as it deals on the Internet not limited to the scope of the country but extends for more than one country, and also the speed of completion of the transfer, exchange and transfer of funds, with the low cost and ease of using Bitcoin technology, and finally the difficulty of tracking those transactions, whether transferring and exchanging those currencies or using them in completing transactions, and this is due to the absence of (third) intermediary parties such as banks, financial institutions, and others.

4. Smart Contract, considered one of the modern technologies that also work through Blockchain, as it relies on them in electronic exchanges, and the following is a presentation to briefly define their nature

(a) **The emergence of the Smart Contract**, the emergence of smart contracts came in 1994 at the hands of NickSzado when smart contracts were used to make transactions in the form of encrypted codes confined to their dealings with two specific parties, and no interference from any parties other than these two parties only (DylanYaga, et al., Op. Tic, p. 32).

(b) **The concept of Smart Contract**, a technology that relies on conducting the exchange process or completing the transaction by sending an electronic message from the selling party and accepting it by the other party, the buyer of the deal, through an electronic chain of Blockchain, which is considered an alternative to traditional contracts upon completion of the subject of the transaction, without the interference of other parties Unlike the seller and the buyer, recording the transaction as soon as it

is performed, and thus it serves many areas and activities such as financial derivatives, insurance premiums, other financial services, government transactions, health services, supplier transactions, and other different and varied fields (Karamitsos et al. 2018, p. 183).

(c) **Smart Contract's** work method, based on creating a match between the selling party and the buyer party through specific conditions on the subject of the deal or transaction according to an electronic message between the two parties via the Internet via the Blockchain. The buyer chooses the deal and contracts it as soon as it is approved and then the subject of the contract is delivered and received between the two parties, and if there is any violation of the terms of the deal or the subject of the contract, the transaction (Swan, Op.Tic, p. 30) stops, and the transaction is completed in one of the types of cryptocurrency electronic currencies, including difficulty in tracking the transaction between the two parties or identifying the subject of the deal and the transaction.

(d) **Characteristics and features of Smart Contract** are characterized by many characteristics that are represented in timing, which distinguishes them from traditional contracts, as well as trust in the transaction or transaction between the parties dealing with it without penetration or interference from unauthorized others, and the difficulty of losing the presence of copies of the transaction or the deal is to ensure that it reaches the parties to the transaction, and the protection and security of the transaction is based on encryption through secure and protected sites according to encrypted codes, the speed, and accuracy in completing the transaction and the transaction between the beneficiary parties in a shorter time than the traditional transactions, and also recording the transaction once it is completed between the beneficiaries, and the last of the costs is lower. Technology compared to conventional contracts (Wohrer and Uwe 2018, p. 4).

(e) **Digital and electronic advertisements**, digital advertisements are considered one of the issues and topics of concern to the field of taxation, especially after many opinions addressed the difficulty of the tax administration in several countries applying taxes on the digital advertisements displayed on social media, and that they increase the level of the informal economy of those countries (Robertson and Nash 2019, p. 5), the nature of digital advertisements is a form of online marketing through digital and electronic advertising campaigns, which are found on websites and social media sites to display goods and services, directly to the consumer without allowing the presence of other intermediaries. Consequently, it is characterized by many characteristics and features such as the low cost of the advertising campaign, the speed of its spread, its limitation to the two parties in the transaction or exchange only without the interference of intermediary or third parties, the immediate interaction with the subject of the deal or transaction, the possibility of directing it to the beneficiaries, and the time flexibility of the advertisement and the campaign, etc.

(AICPA 2019, p. 3), therefore, such activities and dealing with them lead to their continuation in the informal economy, which is difficult to share. T and then lost tax resources for countries with such activities as a result of the current tax accounting insufficiency in providing information about them and laying down supervisory foundations for them.

The previous presentation of the hypothetical (non-traditional) tax issues, which is represented in electronic transactions, is an evolution of technologies and technology mechanisms, as it increases the difficulty of imposing a tax on those transactions due to the absence of the tangible material side on the one hand and its limitation to the two parties to the transaction, transaction or exchange on the other hand This makes it a virtual fake treatment despite achieving economic benefits for those parties, especially when reliance on it increases in the wake of the developments of the COVID-19 pandemic.

11.6 The Relationship of International Tax Accounting with Virtual and Digital Issues

The relationship of international tax accounting with digital and virtual tax issues can be addressed through the following:-

1. Tax accounting and e-commerce, the relationship is determined by the fact that tax accounting in its traditional form does not include rules for electronic transactions, even though it is only possible to rely on the application of the principle of universality of revenue to limit the transactions of the taxpayer from those activities, which leads to the need to understand these transactions and their implications for Tax accounting information exchanged between all concerned parties.
2. Tax accounting and Blockchain, the second is a modern technology that works on the sequence of events for transactions, deals and exchanges, and then it is close to the work of accounting in general, and then it can be used within tax accounting as a development for it. However, tax accounting in its current position is difficult to familiarize with accounting procedures to indicate the transactions that It is carried out and included with that technology, which makes the Blockchain open an area for tax evasion, with its two levels, because of the difficulty of counting, analyzing and completing the established incident of the tax.
3. Tax accounting and cryptocurrencies, accounting in general faces the issue of electronic currency transactions, as these transactions do not allow the existence of an intermediary party between the dealers, so the accounting work is done according to these transactions automatically, which is considered a weakness and strength at the same time, and by referring to tax accounting, its nature

and not to include aspects that qualify it to deal with these developments in the non-recognition of these transactions.

It is clear from the previous presentation that tax accounting itself represents a challenge that must be overcome by following all the modern and new means and capabilities to develop it and make it more suitable not only for electronic transactions, but for other traditional issues that stop reducing and facing the necessity of the need to provide a level of information, indicators and standards, and the development and improvement of science goals tax accounting itself to reach an advanced and updated conceptual framework through which to build practical rules and foundations that deal with those tax problems and issues at the local and international levels and link them with other tax systems, while it is considered a tax union whose goal is to confront tax issues that are difficult for a single independent tax system to face, Rather, it is necessary to achieve the effectiveness of both international tax cooperation and the fulfillment of the requirements of the standard for the exchange of information with tax purposes as a single entity linked to international tax entities together.

4.   Future directions for international tax accounting
     It is represented in the necessity of the need to provide a set of guidelines and directives that define how the professional and practical side of international tax accounting works. This focuses on the need for international tax accounting standards through the following aspects:

 (i)   The justifications for the need for the existence of international tax accounting standards (auditing for tax purposes). The reasons and justifications for the necessity of issuing international tax accounting standards are to specify the following:-
     (a)   The proposed international tax accounting standards depend on the link between the scientific principles and the accounting principles included in financial accounting but are defined in the alternative systems and methods used in the application side of tax, in a way that limits the differences between accounting and taxes, not at the local level, but extending to the international level.
     (b)   The existence of the proposed international tax accounting standards on the possibility of reaching the international tax accounting harmonization and standardization due to the existence of a set of international tax accounting guidelines and directives that can be relied upon in facing international issues and problems such as the problems of multinational companies and the possibility of applying the requirements of exchanging accounting information for tax purposes.
     (c)   The proposed international tax accounting standards contribute to achieving the objectivity of the tax accounting information determined by the accounting rules, procedures, and principles with the application of the conceptual framework for international tax

accounting, and then in turn help in handling the issues resulting from the difference in the application of accounting rules from the tax rules.

(d) The proposed international tax accounting standards help to summarize the tax operations and transactions resulting from the tax compatibility between countries, as they are based on a basic rule represented in those standards, which contribute to building the tax system as they consider the basis for reference to it and the obligation to follow, as is what each deals with a tax system that adheres to tax accounting standards as an independent, unified entity.

(ii) The proposed framework for international tax accounting standards, the proposed framework for international tax accounting standards can be defined through the following:

(a) Standards related to tax accounting for the partial accounting unit, that group consists in providing instructions and directives related to the procedures for determining the event that creates the tax, and how to determine the tax base for the accounting unit according to what is determined by the law and the tax legislation prevailing in the country to which the accounting unit is subject, determining the regularity of the linkage and collection process, as well as determining the concept of transferring the tax burden, and that group considers the beginning of work toward achieving the optimal solution for financial reporting by adding a separate item specified in the basic and attached financial statements, which is represented in a statement of total taxable income, exemptions, exemptions, and expenses that are not deductible, allowing the recipient of accounting information to gain access to income. Accurately taxation, which in turn helps eliminate the gap between accounting profit and tax profit.

(b) Standards related to the tax examination, that group is represented in providing instructions and directions related to the tax examination procedures that the tax administration concerned with the tax review of the partial accounting unit and to ensure compliance with the accounting units subject to tax that they have prepared financial reports in a manner that determines access to tax income and excluded from it of exceptions, exemptions, and others that are determined by law and legislation.

(c) Standards related to the delivery of tax information at the international level, that group is represented in providing instructions and directions through which it works on preparing and configuring the tax information provided by tax accounting to achieve the international dimension so that this information is prepared in a manner that allows achieving the requirements of standards for information exchange for tax purposes at the international level. Perhaps

the standards of that group work to make the tax information from the perspective of the overall unit level, i.e., the state.

(d) Standards related to accounting issues and problems. This group consists in providing instructions and directions that work on dealing with tax issues and problems at the international level, while achieving international tax harmonization and standardization among tax systems when dealing with those problems and issues, provided that laws and legislations take into account the standardization of procedures based on Those international tax accounting standards.

(iii) The relationship between international tax accounting standards and financial accounting standards, the relationship between both international tax accounting standards and financial accounting standards is that if the first is issued, the matter may reduce the handling of the second, and this would limit the degree of differences and discrepancies between accounting income and tax income. Where it becomes clear that it is possible for all the accounting treatments included in the financial accounting standards that are related to the tax transactions and transactions to be included in independent tax accounting standards and to be dominated by the flexible international character in providing a set of alternatives to deal with international tax issues, provided that there is a degree of assurance that they will not Breaching the compatibility and uniformity between the international tax systems.

11.7   Conclusion

A set of results that clarify the role of international tax accounting in evaluating hypothetical and digital tax issues can be reached through the following:

Unifying the issuance of accounting standards with tax laws. It has the effect of achieving the possibility of applying international tax accounting in the tax business environment, which is taking into account the unification of the timing of issuance of the law and tax legislation with the issuance of accounting standards. Unifying the objectives of accounting standards with tax systems, this work deals with achieving uniformity between accounting and tax goals as much as possible from the side that each of them achieves integration between them, as unifying the objectives of international tax accounting is consistent with the objectives of international accounting standards, so that the tax system includes And in accordance with all the principles, assumptions, and objectives on which international accounting standards are built, with the possibility of deriving international tax accounting standards from them.

Developing the performance of local and international tax administration. The development and improvement of the performance of the tax administration is one

of the most important requirements necessary to achieve the efficiency or effectiveness of the entire tax system for what it represents from an executive and practical side, to achieve the requirements of assignment with international accounting standards. The matter requires that the local tax administration be aware and knowledge of the nature of the work of international accounting standards when dealing with international issues and problems, and therefore this factor requires that the tax administration has professional and scientific capabilities commensurate with the outstanding performance of the tax administration.

Evaluate the performance of the tax system periodically. A good and efficient tax system is characterized by the ability to keep pace with the variables and factors surrounding it. This requires that the tax system be evaluated periodically and continuously by comparing it with competing tax systems and working to reduce differences and overcome the shortcomings resulting from the disparity tax information exchanged between domestic and international tax systems.

Establishing rules for international tax examination. Tax standardization and coordination is a recent trend among international tax systems that seek to establish economic unions between them. This has taken into account that standardization of tax accounting procedures, and specifically one of its stages, which is tax examination, is achieved, which in turn requires taking into account the application of law and tax legislation. And what is in line with international accounting standards, which leads to support confidence among all parties in the tax system, and in light of achieving international tax standardization, it starts from international accounting standards.

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Index