Contributions to Finance and Accounting

Hasan Dinçer
Serhat Yüksel *Editors*

Financial Strategies in Competitive Markets

Multidimensional Approaches to Financial Policies for Local Companies

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Determining the Optimal Financial Strategies for Nuclear Energy Companies

Serhat Yüksel, Hasan Dinçer, Çağatay Çağlayan, and Gülsüm Sena Uluer

Abstract The aim of this study is to identify the most optimal financial strategies required for nuclear energy investments. In this context, the studies in the literature are examined in detail and 6 different financial strategies are determined. After that, these strategies are weighted with the help of the DEMATEL method. The findings indicate that the commodity price risk is the most appropriate financial strategy for the nuclear energy investors. Similarly, these companies should also give importance to the currency exchange rate and interest rate risks. On the other hand, it is also concluded that debt financing, equity financing and crowdfunding play a lower important role in this regard. It can be said that nuclear energy companies should mainly focus on the volatility of the commodity prices. In nuclear reactors, some commodities are very crucial, such as uranium and boron. Hence, to provide sustainable financial improvement, the price volatility of these products should be minimized. For this purpose, the investors should use financial derivatives to hedge these prices.

1 Introduction

Nuclear energy means energy is produced from the nucleus of an atom. There are protons and neutrons in the nucleus of every atom. These protons and neutrons are very strongly linked to each other. It is aimed to separate these elements from each other in nuclear energy production. After the separation of protons and neutrons, a very serious energy emerges. Considering the steam of this temperature, electricity is produced. In order for protons and neutrons in the nucleus to be separated from each other, neutrons are thrown into the nucleus. In order to obtain more electricity from nuclear energy, the uranium atom is taken into account (Berdahl et al. 2016; Aydın

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2020). The main reason for this is that there are too many protons and neutrons in the uranium atom.

Another important issue here is that the fragmentation of the atom must be controlled. Otherwise, if this process cannot be controlled, it turns into a nuclear weapon. Therefore, the process of launching neutrons at atoms should be intervened when necessary. In this process, neutron scavengers such as boron are used. Boron slows down the process of launching neutrons into the nucleus. In this context, there are neutron holders made of boron inside the nuclear reactor (Esposto 2008). When these control rods are inserted into the reactor, the nuclear reaction slows down. In other words, the nuclear energy process is being taken under control. This stated situation prevents a possible problem from occurring.

It is possible to talk about many advantages of nuclear energy. First of all, the efficiency of energy obtained from nuclear energy is very high. The main reason for this is that nuclear energy can be obtained around the clock. Generating electricity with nuclear energy increases the energy supply security of the country. Countries can produce their own energy thanks to these power plants (Contu and Mourato 2020). In this way, there will be no need to import the needed energy from abroad. This situation will positively affect the country's current account balance. Another benefit of nuclear energy is that no carbon emissions occur. As can be understood from here, it would be possible to say that nuclear energy is environmentally friendly (Yildirim and Gün 2016; Dong et al. 2018).

However, there are some disadvantages in electricity generation with nuclear energy. The most criticized issue in nuclear energy production is radioactive waste. If these wastes cannot be disposed of effectively, this threatens the lives of living things. Therefore, this process needs to be managed effectively. On the other hand, in the nuclear reactor process, security measures should also be implemented completely. Otherwise, there is a risk of explosion occurring in the nuclear reactor. The explosion in Chernobyl in 1986 is the best example of this.

Another disadvantage in the nuclear power process is related to costs. The initial cost of nuclear power plants is very high. This situation prevents investors from focusing on this area. In order to effectively manage the high cost problem, nuclear energy investors need to be able to produce successful financial strategies. First of all, it is necessary to determine how the needed fund will be obtained (Ho et al. 2018). In this context, nuclear energy companies need to determine whether they will finance debt or equity. In addition, the risks encountered in this process must be managed effectively. Exchange rate risk, interest rate risk and price risk of products are also the best examples to this issue (Jensen-Eriksen 2020).

In this study, it is to determine the most appropriate financial strategies required for nuclear energy investments. In this context, first of all, a detailed literature review was made. In this process, 6 different financial strategies for nuclear energy investments were determined. In the analysis process of the study, it will be determined which of these strategies are suitable for nuclear energy investments. In this process, an analysis was carried out using the DEMATEL method. The results of the analysis obtained will be a guide for nuclear energy investors. In this way, it will be possible

to increase nuclear energy investments in countries and thus increase the energy supply security of the country.

2 Theoretical Information About Nuclear Energy Investment

Nuclear energy is one of the most important energy sources in the world that promises a future with its sustainability. Therefore, considerable works have been done on nuclear energy. The energy obtained from the nucleus of an atom is called nuclear energy, and a powerful fuel is needed to generate this energy. Uranium, as the element/fuel with the most protons and neutrons, is generally considered to be the most suitable element in nuclear power generation, but in order to build a nuclear power plant, enriched uranium needs to be met. Thus, uranium subjected to the enrichment process is used as a raw material in most reactors. An enormous amount of energy is produced by splitting uranium during the fission reaction (Ho et al. 2018). Neutrons collide with the uranium nucleus at great speed to affect this split. This collision causes a fission reaction that releases powerful energy. After the first fission, the emitted neutrons hit other uranium nuclei and continue until the fission occurs in each atomic nucleus. The important issue here is that the resulting energy can be controlled. Because uncontrollable energy will cause fatal consequences. Therefore, inside the reactor there are control rods made of materials such as boron or silver. These substances are very effective neutron holders, and when they are introduced into the reactor, some of the neutrons released in the reaction are retained and the reaction slows down. Control rods can also be retracted to increase the reaction rate. In this way, the high heat generating nuclear reaction chain is kept under control. Since motion energy is needed to generate electricity, the high temperature heat created by fission turns water into steam and rotates the turbine connected to the generator to generate carbon-free electricity (Markard et al. 2020). The electricity generated in the generator is sent to the area where it is desired to be used by transmission lines.

Although the process of generating electricity from nuclear power plants described above seems complex, studies are being made to increase efficiency in nuclear energy production and to ensure nuclear safety. Based on this, the advantages and disadvantages of nuclear energy can be mentioned (Nazlioglu et al. 2011). The first problems encountered when talking about nuclear power plants are that the installation cost of the nuclear power plant is high and necessity of nuclear energy field's the high-level know-how. Nuclear energy investments are quite large investments. For example, the Akkuyu nuclear power plant being built in Turkey with approximately $20 billion is estimated it would cost (Ozmen 2020). Therefore, investors who want to invest in this field are likely to have problems in finding financial resources. The need for a high level of knowledge in the field of nuclear energy is directly related to nuclear safety. Authorities must have competence in

matters such as preventing possible accidents, performing their maintenance and repair perfectly. Because the smallest mistakes made while generating nuclear energy cause terrible results. Therefore, this situation will negatively affect the public acceptance of nuclear energy and will have consequences in many areas such as economic, political, health. At this point, public acceptance is a very important parameter. Because the lack of public support may prevent the establishment of a nuclear power plant. Achieving a national consensus will also encourage investors to invest in this area (Nevinitsa et al. 2020). Problems such as explosion risk, earthquakes, terrorism, nuclear waste disposal are also considered among the disadvantages of nuclear energy. Although these disadvantages are among the factors that affect the acceptance of the public, they also make it difficult to invest in this area. Studies that will increase nuclear safety at the maximum level and neutralize the negative effects of the waste disposal process on the environment and human health may present nuclear energy as an indispensable resource to all societies in the future.

When talking about nuclear power plants, the advantages of these power plants are quite high as well as their disadvantages. One of the first arguments made is based on environmental factors. For example, carbon emission is a big problem for the Earth's ecosystem. In terms of reducing climate change, nuclear energy stands out with its zero-carbon feature along with renewable energy sources. Accordingly, it can be said that nuclear energy is at the first stage in the fight against climate change. Pollution caused by non-renewable energy sources, mainly air, is a serious threat to human health. Nuclear energy comes to the fore again at the point of preventing air pollution (Ozturk 2017). In addition to environmental effects, economic factors also make investment in nuclear power plants attractive. Energy need has been increasing day by day on a global scale. Considering that fossil fuels are running out, it is urgency to turn to alternative energy sources from fossil fuels. Nuclear power is more sustainable at this point. Because elements such as uranium and boron used in nuclear power plants are abundant in the world. In addition, nuclear waste has a feature of being reusable. Energy needs constitute a large part of the current account deficits of the countries. Countries that have to import energy invest in areas such as nuclear energy and renewable energy to produce energy and to avoid the current account deficit (Sainati et al. 2019). The fact that renewable energies also vary according to weather conditions further emphasizes the sustainable feature of nuclear power plants that generate uninterrupted electricity for 24 h. Another reason why nuclear energy, which reduces energy dependency and increases energy security, is important for states is that it provides employment. For example, the Akkuyu Nuclear Power Plant, given as an example above, is estimated to provide employment to approximately 10,000 people. On the other hand, meeting the energy needs of the industry in a cheap way thanks to nuclear energy can also increase the efficiency of the production.

Along with safety, cost is one of the important parameters for building a nuclear power plant. As mentioned before, energy investments, especially nuclear energy investments, are large investments. Although the operating cost of nuclear power plants is competitively low, the installation cost is quite high, as nuclear power plant

opponents claim. Additionally, the disposal process of nuclear waste also has a very high cost. Thus, it is clear that cost management is a strong element of nuclear energy investments. Companies that cannot manage their costs cannot meet their expectations and suffer sad consequences, as they lose control of their income and expenses (Rabinowitz 2016). Cost items should be minimized with a correct cost management in nuclear energy investments. Especially the initial setup cost is an important factor here. For example, when choosing the region where the nuclear power plant will be established, the presence of the resource to be used in the field may reduce the operating costs of such enterprises. If the goods to be used are imported, the foreign exchange risk will also strain the companies in question. As an example, if uranium, the raw material used in nuclear power plants, is imported, a possible exchange rate increase will make the cost more expensive than planned. If the interest rates used in the investment are variable, it can be another factor that increases the cost by bringing the interest risk. All these elements show that cost analysis must be done in detail about nuclear power plants. Investors, frightened by the high cost, will abstain from investing in nuclear energy (Vainio et al. 2017). This will result in the inability to meet the energy needs and the increase in foreign dependency in the energy field. An effective cost management will prevent all these pessimistic scenarios and write positive scenarios that increase nuclear energy investments and make them more efficient.

As seen above, having a strong cost management by making cost analysis effectively is of great importance to invest in the field of nuclear energy. Because these investors have to manage both costs and potential risks. At this point, it would be appropriate to say that managing costs and risks will not be enough on its own. Financial planning made by balancing profit and risk, and a financial strategy in which the necessary financing and investment decisions are made in order to achieve the targets, must exist. Businesses determine their financial strategies by analyzing their current positions. Because companies try to make investment decisions that include the appropriate features in order to grow. With financial strategies that support these investment decisions, the company can maximize its value and bring the company to a better position. Financial strategy, which includes extents such as investment, financing, dividend distribution, is a long-term element of companies' policies that comply with the predetermined objectives (Yoo and Ku 2009). In this context, financial strategies should be managed as effectively as cost management. Any wrong decision that can be taken in this process can lead to bad scenarios that end in bankruptcy. Some suggestions can be made to prevent these bad scenarios from happening for investors who will invest in the field of nuclear energy. As an example, debts can be borrowed with a long term due to high installation costs in nuclear power plant investments. Because short-term borrowings increase the liquidity risk. Derivative agreements can also be made to protect against changes in foreign exchange rates and to fix the rate (Yang and Zhan 2017). Another issue is related to changes in the interest rate. Fixed rate loan agreements can be made to protect against interest rate increases. The importance of financial strategies for nuclear energy investors to overcome all these risks and costs and to make new investments is obvious.

3 Literature Review

Nuclear energy is one of the most important and discussed energy type about its efficiency, reliability, security, and risks economically socially, politically, and environmentally. There are various and vast of research related for economic and financial aspects in the literature. Nuclear development is significant for economic growth and economic advantage (Prăvălie and Bandoc 2019; Poinssot et al. 2016). Moreover, Lau et al. (2019) explained as nuclear based electricity production is increasing economic growth and decreasing CO_2 emissions in the long run for OECD countries when compared non-renewable energy sources by gathering 1995–2015 data. It is also valid for developed countries. Hence, Sarkodie and Adams (2018) contributed that energy consumption, economic growth, and political institutional quality have impact environmental quality and renewable energy (RE) and nuclear is promoting to mitigate climate change with reducing fossil fuel-based countries' economic vulnerability. So, nuclear energy, CO_2 emission rate, nuclear energy consumption rate, economic growth, labour force, real gross fixed capital, return are affecting each other, and they have role on policies. Moreover, relationships can change over time or, with other factors such as other energy sources price (Piłatowska et al. 2020; Nazlioglu et al. 2011; Yoo and Ku 2009; Wolde-Rufael 2010; Apergis and Payne 2010; Lee and Chiu 2011; Luqman et al. 2019; Ozturk 2017; Saidi and Mbarek 2016). Therefore, nuclear is feasible as economic and environmental if nuclear waste can manage properly (Prăvălie and Bandoc 2018).

On the other hand, countries use and invest on nuclear energy to reduce energy dependency and increase energy efficiency. For example, Turkey is dependent to import some energy sources from and it causes huge deficits in national economy. Turkey's main sources are renewables and thermal resources; coal and gas are imported. Nuclear will reduce dependency (Kok and Benli 2017; Ağbulut 2019). However, Esposto (2008) discussed that Italia stopped electricity generation from nuclear after referendum and it damaged to their economy. Otherwise, Finland is small, cheap, and abundant power industry for business and has alternative energy resources. So, nuclear idea is more attractive to produce cheap electricity, but it is costly and dangerous (AlFarra and Abu-Hijleh 2012; Zhang 2007). Many of time fifth reactors proposals rejected until businesses offered nuclear as green energy (Jensen-Eriksen 2020). Furthermore, Krane et al. (2016) said that Middle East countries take care nuclear even they have oil because of national security, civil liberties, international relations, cost, energy security, technology developments and strategic power. Besides, some countries experienced financial, stakeholder, environmental and political problems to build nuclear power such as Turkey, Czech Republic, Slovakia, and Israel (Aydın 2020; Kratochvíl and Mišík 2020; Rabinowitz 2016). On the other hand, Kim (2017) said that countries can act each other differently because of commercial interest.

In addition to these, Nevinitsa et al. (2020) denoted by considering economic and safety indicators, environmental impacts, realization risks, and development, with

developing technology, nuclear reactors became fast and generation of energy satisfied population's and workplaces' demand in Russia. Also, it affects environment and generated demand exports. Therefore, coal and gas consumption can reduce. However, Markard et al. (2020) added that nuclear can be future for China, Russia, and other stated-owned firms' countries, but for others it is not because of nuclear does not fight climate change as developing RE technologies. Also, nuclear is in decline as global stage because of growing opposition, hard licencing, safety concerns, low life cycle, technology decline in the other resources and high costs.

Nuclear energy building construction projects are required huge amount of investments and they are costly too much (Dalton 2019). Buongiorno et al. (2018) explained, nuclear energy has unique and valuable low carbon technology to produce electricity. Nuclear reactor cost is so high and when decreased nuclear reactor cost, decarbonization cost will reduce as well. Furthermore, Kessides (2014) analyzed as Africa has electricity deficit problem and low carbon (C) nuclear reactors can solve problem. However, limited capital and safety creates another problem. Small unit reactors can solve the problem. For example, Gagarinskiy (2018) said that Russia exports nuclear ships for Arctic. So, cost of nuclear buildings and requirement of investments can change to the reactor types, tests and fuel sources will be used in reactor such as uranium (U-235) and thorium (Th-231). Gao et al. (2019) stated as nuclear reactor costs dominates total system costs. Gen IV reactors are more feasible, cost-effective technology. Advanced nuclear fuel cycle technology should provide uranium utilization and lower nuclear electricity cost in Korea. Moreover, Bedenko et al. (2019) tests on high-temperature gas-cooled nuclear reactor operating in a thorium-plutonium nuclear fuel cycle for Gen IV reactor technologies are economical to the computational cost and can solve nuclear power engineering problem. Furthermore, ion beams are more cost effective and useful for testing of nuclear reactors. Development of this technology will improve the system efficiency (Heidrich et al. 2019). Additionally, Yang and Zhan (2017) proposed a ceramic reactor to provide high power generation efficiency, safety, and security. Withal, used uranium sustainability can be recycled again. Also, Ağbulut (2019) studied that Turkey decided to build nuclear power in order to decrease energy dependency. Electricity price will decrease with nuclear energy generation Also, Turkey has thorium reserve as sixth country in the world. This can be used as fuel for nuclear and it can be exported to other countries. Nuclear fuel and technology richness can increase economic growth (Aalto et al. 2017). However, Meng and Yu (2018) denoted as Chinese uranium reserves are limited and imports. On the other hand, construction of nuclear power takes time a long and it has financial effects. Investment amount, time of nuclear construction and management, energy policies, electricity production management among countries' energy resources with nuclear, public opinion, life cycle and cost management, its technology and location choice are main issues for nuclear and successful management will bring energy/electricity generation security from nuclear (Siqueira et al. 2019; Heffron 2013; Zawalińska et al. 2020). For example, Melikoglu (2016) stated that Turkey spend energy investments as 90% to the estimation with nuclear and renewable investments and

they should take precaution on financing. As Gozgor and Demir (2017) remarked, nuclear energy could not respond quickly to investments So, funding management, debt and equity financing is significant issue. Berdahl et al. (2016) studied that science communication about nuclear is important for credibility, funding, publication.

Another issue is nuclear reactor phase outs became a trend in the world after nuclear accidents and it decreased public acceptance in countries. However, nuclear reactor phases out is decreasing value added of nuclear industry, but this value added can be gained by increasing RE. Also, impacts of nuclear decommissioning on sectors can change to the numbers and expenditures of nuclear phase outs. With regard of these, nuclear energy market share did not meet its value for vendors because it offers electricity generation. Nuclear plants and fuel cycle should improve for generation productivity (Bodde 1998). Additionally, Lopatta and Kaspereit (2014) remarked that high level nuclear support energy companies' share prices declined. Their market portfolio and returns change to countries' strong regulatory system. RE support companies were not affected. Also, some of them get abnormal return. Hence, Kunsch and Friesewinkel (2014) added as early nuclear phase-out in Belgium caused benefits on raise in fuel-based resources, foreign dependency, price volatility, high CO_2, and supply safety drawbacks, not increase in RE deployment. However, nuclear power importance should keep to the International Atomic Energy Agency (IAEA) and should be given incentives, but requires huge amount investment (Kim and Jeon 2020; Shepherd 2018; Dalton 2019; Dong et al. 2018). Besides, dos Santos et al. (2013) analyzed that nuclear decreases operating cost in business with energy security. Additionally, Kim (2020) clarified as economic growth and urbanization are increasing GHG (greenhouse gas) emission; manufacturing industry share, RE and nuclear energy are decreasing GHG emission in the long run. Foreign direct investment (FDI) is increasing GHG emission but it is not effective too much. Economic growth is increasing GHG; RE and nuclear is decreasing GHG in short run. Urbanization and FDI has no impact on GHG in short run. Furthermore, Tanaka and Zabel (2018) stated that house price was affected negatively. However, people returned pre-Fukishima consideration after a while in USA.

On the other hand, Gupta et al. (2019) explained that there is negative relationship between nuclear accidents and nuclear public support and positive relationship between energy security risk and nuclear public support. Also, it depends fossil based resources and alternative resources. For example, nuclear energy supports are raising when oil, gas and coal become expensive and scarce in US. Moreover, shutdown of nuclear reactors is costly too much. As Mauger (2018) specified that Fessenheim nuclear reactor shutdown occurred costly because of wrong legislation and agreement. So, it affects energy production negatively if costly shutdown remains.

Another issue, nuclear accidents have impact on risk/benefit perception on people (Ho et al. 2018; Espluga Trenc et al. 2017). Hence, it can damage financially to investments. For example, if perceived nuclear accident risk on people is high, nuclear power support rate will be low and it creates social cost with regard of negative impact on nuclear revenues for future (Huhtala and Remes 2017).

Moreover, Vainio et al. (2017) stated that CO_2 emission rate and information trust shape how nuclear energy risk and benefit are perceived and how changes willingness to pay for other energy resources. However, Murakami et al. (2015) denoted that USA and Japan people are both low preference rate for nuclear. RE willingness to pay higher than nuclear. Otherwise, People are generally willingness to pay Gen IV nuclear energy technology, even some of strong opposers are willingness to pay R&D studies in UK (Contu and Mourato 2020). The reason is that nuclear technology is important for sustainability for willingness to pay (Jun et al. 2010).

In addition to that, Sainati et al. (2019) studied that prescriptive regulatory oversight, vast completion risk, and limiting nuclear liability regimes are problems for nuclear project financing. These can be solved with a strong banking law, security interest, providing ownership and financial requirements and indivisibility between operator and licensee. Risk and waste management is so important and crucial as economical, governmental, and environmental impacts on nuclear power (Gralla et al. 2016; Geng et al. 2018; Espluga Trenc et al. 2017).

4 Defining Financial Strategies for Nuclear Energy Investment Companies

Under this heading, first of all, financial strategies that can be taken into account in nuclear energy investments will be presented. After that, theoretical information about DEMATEL method will be given. In the last section, the analysis results will be shared.

4.1 Selecting the Criteria

In this process, firstly, a literature analysis on financial strategies was conducted. Later, among these strategies, those suitable for nuclear energy investments were determined. Details of these strategy types are given in Table 1.

Table 1 The details of the criteria

Dimensions	Criteria	Supported Literature
Financing Sources	Debt Financing (C1)	Gralla et al. (2016), Gupta et al. (2019)
	Equity Financing (C2)	Ho et al. (2018), Heffron (2013)
	Crowdfunding (C3)	Gozgor and Demir (2017), Ho et al. (2018)
Risk Factors	Currency Exchange Rate Risk (C4)	Lau et al. (2019), Lopatta and Kaspereit (2014)
	Interest Rate Risk (C5)	Murakami et al. (2015), Meng and Yu (2018)
	Commodity Price Risk (C6)	Poinssot et al. (2016), Siqueira et al. (2019)

As can be seen from Table 1, 6 different criteria have been determined in order to determine the most appropriate strategy to be applied by nuclear energy companies. These criteria are divided into 2 different classes. First of all, it is important how to obtain the financing source that companies need. Within this framework, nuclear energy investors can either borrow these resources or utilize their own equity. In addition, whether the debt is short-term or long-term also presents a risk. Crowdfunding is also another alternative for nuclear energy investors to find resources. On the other side, in order to develop effective financial strategies, risk factors should be taken into consideration. In this framework, firstly, currency exchange rate risk plays a significant role. Most of the equipment can be imported from other countries. In this regard, any increase in the currency exchange rate has a rising effect on the cost of these companies. Secondly, interest rate risk should also be accounted in this framework. If companies used floating rate bank loans, the increase in the interest rates makes this debt more expensive. Finally, commodity price risk is also essential for nuclear energy investors with respect to generating optimal financial strategy. The main reason is that some materials are very crucial for these companies, such as uranium and boron. Hence, the price volatility in these elements has an increasing effect on the cost of the companies. In this study, these factors are weighted for the nuclear energy investment companies by considering DEMATEL approach.

4.2 DEMATEL

The DEMATEL approach can be used to determine which of the different criteria that affect a goal are more important (Dinçer et al. 2019). In this process, firstly, the research question is determined (Dinçer and Yüksel 2018). After that, different factors that can affect the research purpose are determined (Korsakienė et al. 2020). In this process, a very detailed literature analysis is required. Subsequently, experts are expected to evaluate these criteria. Using the obtained evaluations, the direct relationship matrix is obtained (Li et al. 2020). Then, the values in this matrix are normalized to make the analysis more robust. After that, the total relationship matrix between variables is created (Zhong et al. 2020). By taking this matrix into consideration, it will be possible to determine the importance of the criteria (Wang et al. 2020). The greatest advantage of the DEMATEL method compared to other similar methods is that it can create an impact relationship matrix between variables (Zhang et al. 2020). This situation helps to determine the causality relationship between factors. Due to this mentioned advantage, the DEMATEL method has been preferred by many researchers in the literature (Jun et al. 2021; Qiu et al. 2020; Zhu et al. 2020).

4.3 Analysis Results

In this part of the study, the importance levels of different financial strategies determined for nuclear energies will be determined. First, 3 different experts were asked to evaluate 6 criteria. These experts consist of academicians who have worked on nuclear energy for at least 15 years. As a result of the obtained evaluations, the direct relationship matrix was created. Details of this matrix are illustrated in Table 2.

Later, this matrix is normalized as in Table 3.

On the other side, Table 4 represents the total relation matrix.

By considering the values of total relation matrix, the weights of the criteria can be calculated. In this framework, the sum of the rows and columns is considered. The details of the analysis results are stated on Table 5.

Table 5 demonstrates that focusing on the commodity price risk is the most appropriate financial strategy for the nuclear energy investors. According to this table, it is also concluded that these companies should also give importance to the currency exchange rate and interest rate risks. On the other side, it is also defined that debt financing, equity financing and crowdfunding play a lower important role in this framework.

Table 2 Direct relation matrix

Criteria	C1	C2	C3	C4	C5	C6
C1	0.00	2.00	2.00	2.00	2.00	1.00
C2	1.67	0.00	1.33	1.67	1.67	1.00
C3	2.00	2.00	0.00	1.67	1.67	1.00
C4	3.00	3.00	3.67	0.00	2.00	1.67
C5	4.00	4.33	4.33	2.67	0.00	1.00
C6	5.00	5.00	5.00	5.00	5.00	0.00

Table 3 Normalized matrix

Criteria	C1	C2	C3	C4	C5	C6
C1	0.00	0.08	0.08	0.08	0.08	0.04
C2	0.07	0.00	0.05	0.07	0.07	0.04
C3	0.08	0.08	0.00	0.07	0.07	0.04
C4	0.12	0.12	0.15	0.00	0.08	0.07
C5	0.16	0.17	0.17	0.11	0.00	0.04
C6	0.20	0.20	0.20	0.20	0.20	0.00

Table 4 Total relation matrix

Criteria	C1	C2	C3	C4	C5	C6
C1	0.07	0.15	0.15	0.13	0.13	0.07
C2	0.12	0.06	0.12	0.11	0.11	0.06
C3	0.14	0.14	0.07	0.12	0.11	0.07
C4	0.21	0.21	0.23	0.08	0.15	0.10
C5	0.25	0.27	0.27	0.19	0.09	0.09
C6	0.36	0.37	0.37	0.33	0.32	0.08

Table 5 Weights of the criteria

Criteria	Weights
Debt Financing (C1)	0.1572
Equity Financing (C2)	0.1520
Crowdfunding (C3)	0.1567
Currency Exchange Rate Risk (C4)	0.1656
Interest Rate Risk (C5)	0.1753
Commodity Price Risk (C6)	0.1932

5 Conclusion

Nuclear energy investments provide serious benefits to the country's economy. First of all, since the country can produce its own energy, energy supply security will be achieved. In this way, the country will not have to import energy, and this will positively affect the current account balance. On the other hand, thanks to nuclear energy and electricity generation, carbon emissions in the country will be reduced. This means less environmental pollution. In this way, it will be possible to reduce the number of sick people in the country. Thus, the labor force in the country will not decrease and it will be possible to increase the production volume. In addition, by reducing the number of sick people in the country, healthcare spending in the country can also be reduced.

As can be seen from here, nuclear energy investments are vital for both social and economic development of the country. However, the initial cost of these investments is very high. If this situation is not managed effectively, the success of nuclear energy investments will be jeopardized. Therefore, nuclear energy companies need to apply the right financial strategies. The main purpose of this study is to determine the most optimal financial strategies required for nuclear energy investments. For this purpose, the studies in the literature were examined in detail and 6 different financial strategies were determined. Later, these strategies were weighted by taking the DEMATEL method into consideration.

It is concluded that the commodity price risk is the most appropriate financial strategy for the nuclear energy investors. Additionally, it is also concluded that these companies should also give importance to the currency exchange rate and interest rate risks. On the other side, it is also defined that debt financing, equity financing and crowdfunding play a lower important role in this framework. While considering these results, it is determined that risk management plays more significant role than the financing issues. These results demonstrate that nuclear energy companies should mainly focus on the volatility of the commodity prices. In nuclear reactors, some commodities are very crucial, such as uranium and boron. Hence, in order to provide sustainable financial improvement, the price volatility of these products should be minimized. For this purpose, the investors should use financial derivatives to hedge these prices. In addition, interest rate risk should also be minimized. Within this context, fixed rate bank loans should be used so that this risk can be hedged effectively.

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Accelerating the Asset Turnover Ratio as an Effective Cost Cutting Policy

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Abstract From the classical economic point of view, 'firm' is a microeconomic agent with one clear objective, i.e. profit maximization. This objective, given the simple linear form of the profit function, requires firms to implement one of the two broad strategies that are available to them at the corporate strategy level. These two broad strategies, namely, are the 'revenue maximization' and 'cost minimization' strategies. Needless to say, choosing the appropriate strategy depends on the market conditions and the features of the products supplied by the firm. In a typical 'monopolistically competitive' environment, firms would be much more inclined to differentiate their products from those of their competitors to be able to enjoy higher mark-ups. However, as competitive pressure intensifies and the number of available substitutes for the firm's product increases in the marketplace, the profit-maximizing firm may begin to consider cost-cutting strategies more appropriate. Although cost-cutting has generally been accepted from a purely financial perspective as any action that pushes down the marginal production cost of a product and long-run average cost curve of a firm, it indeed may involve more complex operational measures than that. In fact, any action that improves the asset use efficiency might also help firms cut their production costs. Plus, this is not a surprising fact since microeconomic theory has already established the inverse relationship between the costs and efficiency quite convincingly. This chapter is an attempt to underline the significance of this clear, yet generally ignored fact.

1 Introduction

The neo-liberal economic theory of 'firm' has confronted with harsh criticisms for being a black box theory in the past (Demsetz 1997; Walker 2020; Andersson and Johansson 2018). Nonetheless, given the fondness of academic economists for pure

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theoretical analysis above practicality, this black box understanding (or lack of understanding) of the firm continued to prevail in the economics textbooks. According to this neo-liberal black box approach, the firm is a microeconomic agent that takes inputs on one side, somehow processes them (this is the black box part) and reveals the output from the other side. That is to say, the firm from a theoretical economic perspective is a simple transformation machine, which transforms the inputs that are received at a certain cost to outputs that are valuable in the marketplace hopefully above the costs. Specifics of that transformation process, however, has usually been not that much interesting to economists so the mechanics of this transformation process such as the HR management issues, the sales and marketing activities, financing, procurement etc. are left to the diligence of business management students.

Of course, this sort of a simplification overlooks many points regarding how a firm functions. However, quietly luckily for us, i.e. the economists, the fact that a representative firm is a profit maximizer stands as an iron rule. The meaning of that in plain English is that whatever the firm does in its internal processes, it does these for the sake of maximum profit in the long run. That is why, even in the case of the limited understanding of the economists regarding the firm, economists still have much to say regarding how profits could be boosted.

Before the reader objects to this kind of a rough economic caricaturizing of the firm, let us admit the existence of theories within the realm of the discipline of economics according to which firms could seek different objectives other than maximum profit. For example, "the motivations theory of the firm" recognizes the fact that the firms' objectives are set by the executives of the firms (Gottschalg and Zollo 2006; Hickman 1955). As a matter of fact, Deacon (2004) provides a broad and interesting discussion of the human behavior in relation to different personality types resulting in differing motivations in the general sense. In a more specific way, concentrated only on the firm management, we could argue that if the owners of the firm, or the executive team members, had a stance against the weapons, alcohol etc., (for whatever reason such as religious beliefs, ethical concerns, political views, etc.) they could simply refuse to produce and sell weapons or alcohol even in the case that producing and selling such items would cause a boost in their profits. In short, the religious beliefs, values, moral standards etc. of the key stakeholders such as the investors, entrepreneurs or managers may prevent a firm from investing in the most profitable areas.

Likewise, "the agency theory of the firm" is just another theory challenging the simple assumption of an only-for-profit organization. The agency theory of the firm suggests the possibility of internal conflicts in the interests of the owners and the managers of firms, leading the firms to taking managerial decisions that are not in line with the best interests of a profit-maximizing firm but in line with the personal interests of the managers (Gauld 2018). Agency theory (also known as the principle—agent problem) stands as a real challenge to the general assumption about the obsessively profit-maximizing firm. Of course, under ideal conditions, managers (agents) are supposed to take their decisions to maximize shareholders' (principals') wealth. Since the value of the firm should increase for this, managers should be

required to take the decisions that would increase the value of their firms. However, this is the ideal situation and, real life is far from being ideal. Michal C. Jensen, a Harvard Business School professor, claims that so many managers are squeezed in between the pressure to maximize the value of their firms and meet the demands of stakeholders. As explained by the "stakeholder theory", in such situations, managers are forced to consider the interests of all the stakeholders in a firm. Principle—agent problems, or stakeholder conflicts in a broader context, in real life should be considered from this perspective of the stakeholder theory. If principle—agent problems are far from being so severe, a firm cannot maximize value, Jensen writes, if it ignores the interests of its stakeholders. According to Jensen (2000), if we tell all participants in an organization that the organization's only purpose is to maximize value, we cannot achieve maximum value for the organization. We somehow need to come up with simple compromises to reconcile the maximum value (maximum profit) motive with the interests of the managers and the other stakeholders. This is the way to achieve the lifetime maximum profit goal. Naturally, there must be mechanisms hindering severe principle—agent issues like performance-based compensations, threat of firing, threat of take-over etc. otherwise these issues might lead to bankruptcies as it was the case in Enron's bankruptcy.

Apart from these theories, there exist real-life situations as well which may cause firms to pursue some other objectives rather than maximum profit from time to time even when the firm is not influenced by any sort of motivations or agency problems. For instance, a firm entering a foreign market may focus on maximizing its sales in the very first years instead of profits. A firm that is illiquid may try to melt down its inventories to create cash and, in order to accelerate the days in inventory (also known as inventory period), may sell the goods in stocks cheaper than the profit-maximizing price level. These are all reasonable actions given the market conditions and the priorities of the firm in its special context. Yet firms cannot deviate from positive profit goal for too long. Other objectives such as expanding market share, increasing sales, accelerating cash creation etc. may be pursued whenever needed but the goal should be the profit in the long run.

In sum, profit really seems to be the viable and goal for the representative firm. That brings us to the requirement of a detailed analysis of the profit function. Profit is a simple relationship between the revenues generated and costs made. It could be written in the following form; where π stands for profit, TR stands for total revenue and TC stands for total cost.

$$\pi = TR - TC$$

Without doubt, profit function is indeed more complex than that since TR, itself, is a function of quantity produced and selling prices while TC depends on various factors such as raw material costs, energy prices, fixed costs etc., which are not under the direct control of the firm in many cases. Nevertheless, the above equation can draw our attention to a very important outcome without loss of generality. A profit maximizing firm should either maximize TR since this would positively affect the

profits or dampen the costs since *TC* term carries a minus sign in front of it and hence its dampening would boost the profit.

As a third option, it is possible in theory to maximize the revenues while minimizing the costs and so the profits would be maximized as the firm achieves the best of both worlds. However, this theoretical option is hard to realize in practice since a firm should create a premium feeling for its products or services if it wants to achieve revenue maximization. That is so because in order to maximize the revenue gains (from the same amount of sales), firm needs to charge higher price. Charging higher price means the product or service in offer has no close substitute at lesser price levels (hence at least some degree of product differentiation should have been achieved) and the price elasticity of demand on the product or service should have been reduced down effectively by the firm. That could be achieved either by adding some features to the product that would increase the necessity of the product or service for the consumers or increase the addictiveness of the product or service. In short, user experience should be excelled in one way and/or the other. Going both directions would require the firm to spend more under normal circumstances. Hence, boosting revenues and damping costs simultaneously could be a true challenge. Though there are real life cases where we observe brilliant application of ingenious strategies that allow simultaneous achievement of these seemingly contradictory objectives. For example, the famous Asian-style American restaurant chain Benihana is such an example which is very successful in shortening its throughput time like a cheap vendor while able to differentiate its prices like an upscale restaurant at the same time. The remaining parts of this paper are organized as follows. In the second section, different market types will be introduced and the market and product features that call for cost cutting will be discussed. In the third section, the importance of asset turnover in reducing the production costs will be argued with real life cases. The fourth section will conclude.

2 Classification of Markets and the Relevant Profitability Strategies in Each Market

The two theoretically opposite market settings for firms, given that the number of consumers stays the same, are the perfect competition and the pure monopoly markets. We assumed that the number of consumers does not change to rule out cases highly rare and self-similar cases like monopsony. More common other cases, like duopolies or oligopolies, on the other hand are in fact nothing but special cases of monopolistically competitive markets. Therefore, everything in between perfect competition and pure monopoly might be classified under monopolistic competition for the purposes of our discussion below. An appropriate spatial representation of this situation could be made with a line spectrum on which the different markets are positioned. The following table is drawn in to provide the reader with a chance to visualize the hypothetical locations of these three different market types. Please note

Table 1 Different market types with their relevant assumptions and profitability strategies

	Market types	
Perfect competition	Monopolistic competition	Pure monopoly
Standardized goods	Similar goods with slight differences	Sole producer of goods with no close substitutes
Many sellers, all using similar technologies, all operating under similar conditions	Handful of sellers enjoying limited and varying degrees of monopolistic power	Retains monopolistic power even in the long run since external competitive pressure is nil
Zero mark-up capacity	Some mark-up power since they can set their own prices thanks to their limited monopolistic powers, yet their pricing power is under competitive pressure	Highest mark-up capacity in accordance with the elasticity structure of the good
The Most Relevant Profitability Strategies in Each Market Type		
Cost-Cutting Strategies	Product Differentiation Strategies Leading to Price Differentiation	Perfect Price Differentiation

down the differences in their characteristic features (i.e. their dissimilarities) for the following section.

Table 1 states that in a perfectly competitive market setting, by assumption, we believe in the existence of infinitely many producers and consumers. That assumption is highly illuminating for it tells us that we need so small (to be precise, infinitely small) market participants for the sake of having the perfect form of competition in the marketplace. Market participants should be so small to secure the idea that none of them would be able to exert power on the terms of the market. Terms of the market, by the way, are the production quantity and selling price. None of the market participants, i.e. neither the producer(s) or the consumer(s) should be able to influence the selling price or the quantity of production. The chance to create an impact on the market is a monopolistic capacity and monopoly is the most alien element that one could think of in the perfectly competitive setting.

In order to render the perfectly competitive firms incapacitated from grasping even the tiniest bit of monopolistic power, we further assume full identicality of the goods produced by them (which means perfectly competitive goods are homogenous and the producers cannot differentiate their goods from the goods of their competitors no matter what they do). Under similar access conditions to these goods, i.e. if the costs of accessing the goods of any firm is the same across consumers, none of the firms would be able to differentiate their prices. In the case that they are unable to come together and form a cartel, which is difficult in this situation because of the mind-boggling number of so small firms, this uniform price would be equal to the marginal production costs of the very last units produced and sold by the firms. That uniformity then implicitly tells us that each firm's both total and marginal cost structures should be the same, which in essence means the production technology

adopted by each firm should be the same all across the industry. Uniformity of the production technology coupled with the fact that each and every firm should be pricing their goods at the price that is equal to the marginal cost of the last unit produced and sold by them makes it obvious that these small firms are forced to produce on their efficient scale point on their long-run average cost curves and hence they would possess no 'excess production' capacity. Their marginal cost prices should be identical with the minimum of their long-run average costs and they should thus be making profits equal only to their opportunity costs financially (or, in other words, they should be making zero profits economically).

Under these harsh competitive conditions then, these small firms simply cannot earn enough income that would allow them to spend on R&D projects or advertisement campaigns. Because should they choose to spend some of their financial earnings, which are equal to their opportunity costs, their net income falls below their opportunity costs. In such a case, it does not make sense for them to stay in their current industry. As a result, the logic of economics dictate that they would not be able to improve or differentiate their products and so they would not be able to gain any degree of monopolistic power even in the long-run. They seem simply stuck at where they are. However, they indeed have an option to boost their profits above the zero economic profit threshold. If they cannot differentiate their products and so they cannot differentiate their price, let them cut costs and lower their sales prices. If they could somehow cut their costs to levels lower than that of their competitors, they would be able to lower their prices more than their competitors and gain the upper hand in competition.

3 Importance of Asset Turnover for Cutting Costs and Improving Profitability

As an intriguing example, I would like to first present the case of BİM Birleşik Mağazacılık A.Ş., a Turkish retail giant in the discount stores industry, to shed light to this discussion. Established in 1995, BİM had 7740 discount stores in Turkey, 440 stores in Morocco and 300 stores in Egypt as of the end of 2019. BİM stores are known for their offering of basic food items and simple consumer goods at competitive prices. Once we look at the goods offered by BİM more closely, we see that BİM pays special attention to carrying at most around 600 different items in its stores at a time. This limitation is necessary to contain the stock management and distribution costs along with the sizes of their stores. Second, BİM stores are known for their simple designs. Thus, BİM spends no extra money on fancy light fixtures or attractive interior arrangements. Third, BİM never opens stores on pricy main streets but rather choose to be located on the parallel streets. This policy helps them to pay lower rents for their stores. Fourth, they hire just enough staff to run their stores and all the workers are responsible for different tasks. This is a policy designed to contain labor costs of course. Fifth, it does not sell butchery products because if it did, it