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Sustainable Decision-Making Model: Loyalty Points Through Email Communication With Real Option Valuation

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Abstract

Nowadays, many companies cannot see the digital investment that plays a main role in the IR 4.0. Therefore, this study is investigating the study of investment as plays a critical role in an analytical activity to assess the benefits and costs of an investment and can be used as an investment justification. Traditional investment appraisal uses a financial approach where the benefits and costs are quantified in a certain amount of value for money and then compared in value. Moreover, this study is revealed the fruitful outcomes because revealed the investment valuation method with NPV (Net Present Value) and ROV (Real Option Valuation). ROV is an alternative to financial valuation. Seeding from the same philosophy as Financial Option, ROV has advantages in handling the flexibility, risk, and volatility that may occur from an investment. Thus, ROV is considered more able to appreciate an investment that has these characteristics. Investment appraisal with ROV is better able to appreciate investment than traditional financial methods, as shown by ROV's NPV results in the case of marketing with Loyalty points through email communication as a digital investment that are greater than ordinary NPV. This is because ROV can appreciate flexibility in investments that have choices of investment plans in the future.

Keywords: Sustainable, Investment, Net Present Value, Real Option Valuation.

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Introduction

Many companies recently can't see the digital investment plays a main role in the IR 4.0 (Ariffin & Ahmad, 2021; Biancardi et al., 2023). In an investment study, the estimated costs, and benefits to be obtained from an investment are analyzed and the results are used to determine

whether the investment is worth making or not. If the benefits of an investment outweigh its costs at the level expected by the decision maker, then that investment will be executed and if not then vice versa.

Traditionally, the assessment of the costs and benefits of investments is carried out with a financial assessment. Some examples of investment valuation with a financial approach are ROI (Return on Investment), NPV (Net Present Value), and DCF (Discounted Cash Flow). The financial approach has the disadvantage of assessing investments that are strategic in nature as well as IT (Information Technology). Strategic investments usually have benefits that are difficult to measure by financial tools (intangible) (Zhang et al., 2023).

Apart from that, the existing methods are considered unable to capture the true value of financial benefits from IT. Many cases of IT investment are not feasible according to traditional financial valuations as already mentioned but turn out to be feasible in reality. This is due to the method analyzes only a single scenario against the future of the investment plan (DePamphilis, 2022)

The above explanation can be simplified by saying that traditional methods fail in assessing IT investments because they ignore the value of flexibility. But then came an investment appraisal approach called real options that was able to create a portfolio of options for IT investments that could be taken in the future in response to changing business conditions. Real option is an adaptation of a financial option to assess investments instead of stocks. A financial option is a contract to buy or sell shares at a certain time in the future. This contract is only a right and not an obligation, so it does not have to be executed if the future share price is unprofitable.

The ability of financial options to capture flexibility and handle the risks that exist in investing is adopted in real options to assess non-stock investments (Alexander et al., 2021;

Priyadi et al., 2022). Concept Real option already evident since mid-80s in the industrial R&D community pharmacy to determine which project should be funded and not, and in the late 90s appear idea Use Real option to judge IT investment. Use Real option Rooted from the premise that every plan is a choice. Every project remains an option as long as management has the freedom to speed up, cancel, delay, or expand the project. This freedom has a value that can be analyzed quantitatively. This method of valuation of investments with real options is referred to as ROV (Real Option Valuation) (Ryandono et al., 2022; Zhang et al., 2023).

Literature Review

Real options come from studies conducted to determine the value of a financial option in the world of stocks. In a financial option, an option is a right, and not an obligation, for an option holder to execute a transaction (buy or sell) share. On the other hand, the option must be exercised by the option writer or option seller), and it is their obligation to buy or sell a certain number of shares to the option holder. An option is defined as a contract between the seller and the option holder to transact a certain number of shares at a certain price at the time the contract matures (Penizzotto et al., 2019).

There are two types of options, put and call options. Call option is the right to buy shares obtained by means of the call holder first buying a call option from the seller of the call option with an agreement on the call price, term, and share price at the time of maturity (strike price). The investment of the call holder will return capital or profit if at the time of maturity of the call, the share price ≥ call price + strike price, and vice versa for losses.

Put Option is the right to sell shares obtained by means of the put holder first buying a put option from the seller of a put option with a share of the put price, timeframe, and price at the time of maturity (strike price). The investment of the put holder will return capital or profit if at maturity, the share price ≤ the strike price – the put price, and the loss will be obtained if it is the other way around (DePamphilis, 2022; Zhang et al., 2023).

For any type of option, whether it is a put option or a call option, the strike price value that causes losses will not harm the option holder. In the event of such an event, the option holder will choose to abandon the option and not execute the contents of its contract because the option is a right and not an obligation for the holder. By ignoring the option, losses will be minimized only to the extent of the price of the option purchased.

Based on their execution time, options are divided into three types, such as European style that is the execution of a contract can be carried out only at the time of its maturity or at its expiration. American style, contract execution can be carried out at any time before the expiration period. And Dress style, contract execution can only be carried out at certain times until the expiration of the expiration date (Rezaei et al., 2021).

The price of an option at the time of its execution is in one of three possible circumstances: in-the-money, at-the-money, or out-of-the-money. In-the-money options have a positive intrinsic value, that is, options that if executed will make a profit based on the rules previously described. An at-the-money option is one that will break even when executed, while an out-of-the-money option is an option that will bring a loss.

Departing from the same philosophical basis as financial options, real options are defined as a right, not an obligation, to carry out business decisions, especially in terms of investment. For example, the opportunity to invest by expanding the company is a real option. Unlike financial options, real options cannot be traded, so in such cases, the owner of the company cannot sell his rights to expand the company to other parties. In analysis to generate investment decisions, real options are call options. This is because both real options for investing, and call options are the act of spending funds (Costanza et al., 2021).

The fundamental advantage of real options is that in this method a high volatility factor is a profitable thing. The traditional financial method approach considers high volatility to have high risks and high discount rates and high discount rates that will reduce the value of investments. In real options high volatility reflects high value because high volatility creates the possibility of increasingly large future values. This is because we will only execute an option if it exceeds the expected strike price. Meanwhile, volatility in the negative sense will not be detrimental because we will definitely not execute it.

Valuation of investments with real options is called ROV (Real Option Valuation). ROV can be done with 2 approaches, the binomial model approach and the Black-Scholes option pricing model approach. Both of these models derive from their use to assess financial options. In a binomial approach, the opportunities or options that exist in an investment are modeled as having the possibility of branching into two branches at each predefined time interval. This branching into two models the increase and decrease in the value of assets. An option is assumed

to be taken and executed if the value to be obtained from that option exceeds the costs incurred for execute it. The difference between the value to be obtained in the future and the capital to be issued on an option is adjusted to the possibility of the option occurring, then discounted to the present value to get the value of the option of Black-Scholes option pricing model approach. In essence, it can be seen as an extension of the binomial model.

In this model, the number of time intervals between current and execution time is close to nil or the time interval between options is close to zero. The Black-Scholes model has advantages in ease of implementation over binomial approaches but has limited assumptions that make a flexible binomial approach preferred for some cases (Khan et al., 2023). Henceforth, options that are not in the financial option domain will be called options.

Black-Scholes Model

The Black-Scholes model or commonly called Black-Scholes is a price model of financial instruments such as stocks whose value always changes over time. In 1973, Fischer Black and Myron Scholes published a model formula used to determine the value of a call option:

$$C = AN(d1) - Xe - rfT\, N(d2)$$
$$d1 = \ln(A / X) + (rf + (\sigma^2 / 2))T\, \sigma\sqrt{T}$$
$$d2 = d1 - \sigma\sqrt{T}$$

C = call option value
A = value of underlying asset
X = exercise price/strike price r_f = risk-free interest rate
T = expiry period
σ = standard deviation (variance) of value changes underlying assets (A)
N = standard cumulative normal distribution

Binomial Model

The Black-Sholes model assumes the uncertainty of a lognormal change in the value of a distributed (A) stock. In [4], the value of A is assumed to change following the binomial distribution. Figure 1 is a binomial model of the change in rising stock prices with a decreasing factor of u and an increase factor of d.

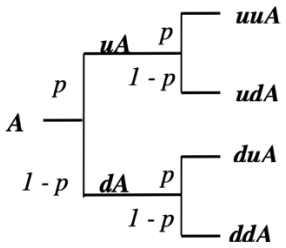

Figure 1. Binomial Model

Starting at the initial time t0, in a period of time (□t), the value of A can either increase to uA with probability p or fall to dA with probability 1-p, where d<1, u>1, and d<r<u, with r = 1 + rf. The value of you is defined as eσ.□□t and the value of d = 1/u.

The final value of the call option of A after □t is Cu = max[0, uA - X] or Cd = max[0, dA - X] with probabilities of p and 1-p, respectively. With a value of p = (erf.□t - d)/(u - d), the value of the call option is:

$$C = \frac{pCu + (1-p)Cd}{R}$$

$$= \frac{p\,\max[0, uA - X] + (1-p)\,\max[0, dA - X1}{R}$$

ROV Parameters for IT Investments

Whatever model is used by both Black- Scholes and binomials, there are five parameters to know to assess investments with an ROV are Risk-free interest rate. Risk-free interest rate is a Return on project requested and usually based on risk-free interest rates. Exercise price, exercise price is the same as strike price on a financial option, which is the price paid to buy a stock. In real options, exercise price is the cost of investment. Time to expiration, which is the length of time before a decision makes a choice. Also, the value of underlying assets, this is the current stock price whereas in real options this is the present value of the expected cash inflow. In the case of traded asset investments, the value of cash inflows is based on the market price of the asset while in non-traded assets the value of cash inflows can be in the form of an increase in income or savings that occur.

In addition, volatility is also taken a role. Volatility is a measure of uncertainty about the value of an opportunity in the future. In theory this is the standard deviation estimate of the growth rate of the value of the asset, while in non-traded asset investments volatility is the probability of cash inflows to be obtained in the future.

Volatility is determined by two kinds of risks. Unique risk, or also called private risk, is a risk that is inherent internally in every organization and becomes part of what can be controlled. Unique risk is expressed in probability. For example, how likely is it that an IT project will fail, or how likely it is that a new firewall could be breached by hackers.

Estimating unique risk is a matter of expertise and data. Statistics from both own and public databases are commonly used by insurance estimators. The pharmaceutical industry estimates it with a comparison diagram between successful and failed products.

The second form of risk is market risk or systematic risk, which is a risk that is in the external environment of the organization so that it cannot be controlled. This risk reduces the value of the asset. An example of market risk is the opportunity to increase bank interest rates, or commodity prices.

Methodology

Using an ROV to evaluate an IT investment project involves three steps (DePamphilis, 2022)capturing and formulating choices, analyzing options, and executing choices/decision making.

Formulation of the Choice Framework

It is the process of identifying and defining the existing opportunities of an investment. An enterprise IT Plan (IT Plan) can be used as an input to this process.

In [5] the stage of formulating the choice framework is called application framing. This activity begins with problem mapping [6] to determine the factors influencing decisions as well as the necessary plans, timing, and choices mapped to three types of attitude approaches: pessimistic, cautious, and optimistic (see Table 1).

Table 1. Strategy Matrix

Approach	Factor	Plan	Time	Choice
Pessimist				
Be careful				
Optimistic				

Optional Analysis

Choice analysis is divided into 3 activities, on the first one is analyzing the business plan. Analysis the business plan will provide information on the cost and payoff value of the investment. This activity is also called base scoping appraisal (deterministic appraisal) or deterministic appraisal. Second is Assessing risk, this activity is to analyze market risk and unique risk that will determine the value of volatility. In the case of traded assets, market risk is the volatility of the value of the asset being traded while unique risk is the probability of successful investment implementation in terms of the company's internal aspects. These internal aspects can include the company's capabilities, technical readiness, and resources. The company's investment data and historical records can be referenced to determine the unique risk value(Costanza et al., 2021).

Furthermore, implement a choice algorithm is also important. It starts by drawing a picture of the decision tree structure of the investment. Calculates the gross value of each stage of the net value of the next stage, using the net value as the underlying asset parameter, and the cost of the next stage as the strike price. This calculation is carried out backwards from the present value in the business plan, namely the gross value at the final stage, through the previous stages(Rezaei et al., 2021).

The methodological scheme is depicted in Figure 2.

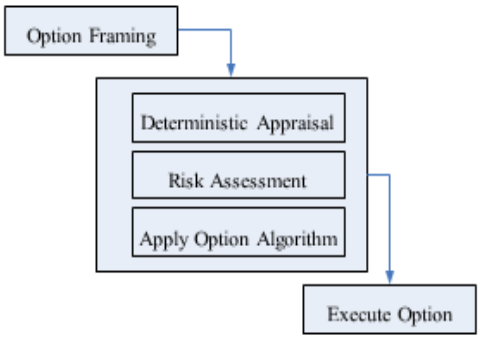

Figure 2. Real Option Methodology

Preferred Execution

An option will be executed if the value is "in-the-money", i.e., when the value of the underlying asset exceeds its strike price i.e., when the payoff value exceeds the cost of executing it. The choice made will depend on the conditions that will occur in the future.

Results and Discussion

Investment Cases Loyalty Points Through Email Communication

Petronas Dagangan Berhad (PDB) operates as a marketing arm of Petroliam Nasional Berhad (PETRONAS) for petroleum products and service station. PDB has bulk depots in Labuan and Sandakan in Sabah. In Sarawak, the company has an LPG (liquid petroleum gas) bottling plant in Bintulu. The company was founded in 1982 and based in Kuala Lumpur, Malaysia. PDB was listed on Bursa Malaysia under the Main Market. The company is trying to implement loyalty points through email communications to support and improve the performance of its business processes. As a company that has the main business process in the marketing of Petronas products, Petronas Dagangan Bhd often faces important situations and requires an immediate response. The implementation of loyalty points through email communication is expected to increase the responsiveness of company employees to the situation (Investment Merits, n.d.).

The investment in customer satisfaction on loyalty points through email communication is expected to reduce communication costs for information that is important and needs an immediate response. In the business process, the categories of information that are important and need to get an immediate response through loyalty points on email communication are those related to marketing and monitoring control.

Loyalty points through email communication are also expected to increase employee responsiveness in business processes that increased responsiveness, resulting from the integration of loyalty points through email communication with enterprise applications that support business processes because loyalty points through email communications allows business processes to be carried out without being restricted by venue. Thus, some potential losses caused by lack of responsiveness and accessibility to critical information in business processes are expected to be suppressed (Rezaei et al., 2021).

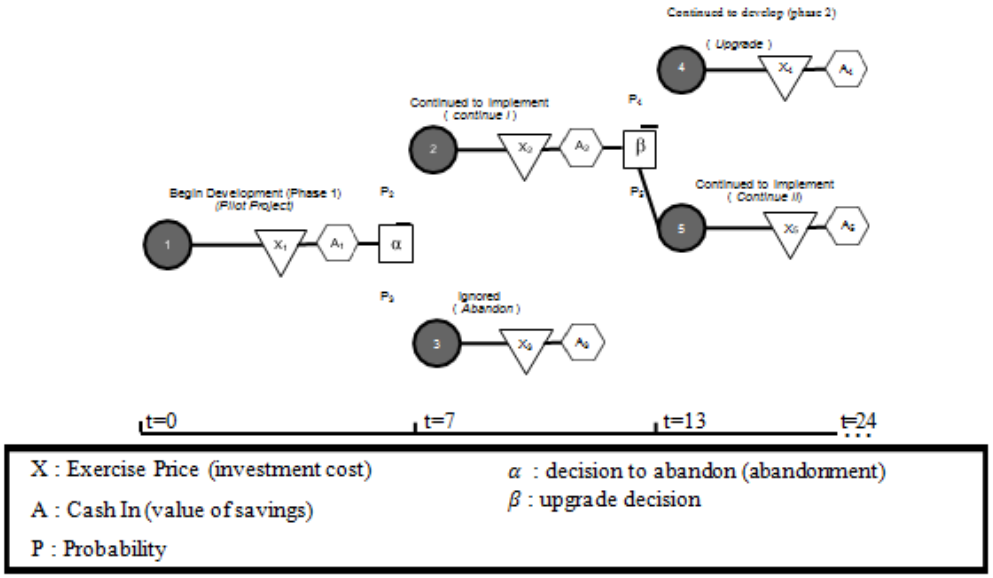

Figure 3. Binomial Investment Model Loyalty points through email communication

IT Plan Loyalty Points Through Email Communication

The IT plan for loyalty points through email communication consists of 2 stages. Phase I is the initial implementation of loyalty points through email communication in a pilot project that will forward regular e-mails that are informative and sent by other users.

In phase II, loyalty points through email communications are integrated with the company's applications as a means of collaborative business process integration between different roles. These applications are not necessarily all mobile accessible. For this reason, it is necessary to integrate loyalty points through email communications with applications owned by Petronas Dagangan Bhd. With the implementation of loyalty points through email communication phase II, activities and actions of business processes in the application such as requests, submits, approvals, and others can be done anytime and anywhere via handheld.

Table 2. Loyalty Strategy Matrix points through email communication

Approach	Factor	Plan	Time	Choice
(Beginning)	-	Initial implementation of loyalty points through email communication in a pilot project with the ability to forward new e-mails that are important and necessary got an immediate response.	First 5 months	pilot project
Pessimist	User enthusiasm is low. Loyalty points through email communications are considered less useful so that the expected benefits do not occur because they are not used in an optimum way.	Pilot project stopped to avoid operational costs	The beginning of the 6th month	abandon

Be careful	Sufficiently high technical difficulty to integrate with enterprise applications and there is no urgent need for it	The pilot project is maintained in anticipation of future further development needs	The beginning of the 7th month and the beginning of the second year	continue
Optimistic	Low technical difficulty to integrate with enterprise applications and there is a need for it	The pilot project is updated to integrate with the company's applications.	early sophomore year	upgrade

Formulation of the Choice Framework

Based on the existing IT loyalty points through email communication plan, an implementation strategy is formulated in a strategy matrix. The strategy matrix is made by considering and anticipating the possibilities that will occur in an investment plan. A choice framework is created for an investment period of 2 years, with a period between stages of choice every 6 months.

The strategy matrix of loyalty points through email communication defined is given in Table 2. The choices captured from the IT plan and strategy matrix are compound options, so they are modeled with a binomial model. Per Figure 3, the IT loyalty points through email communication plan consists of 4 time periods that include 2 stages of decision making. The first period lasts for the first six months (0□t□5) prior to the abandonment option. The second period is valid for the next six months (7□t□12) before the option upgrade decision is made. The third and fourth periods last during the second year of implementation (13□t□24). The assumption of the value of each interest rate in the period (rf) is 5%.

Deterministic Assessment

A deterministic assessment is carried out on both stages of development to determine the financial value of costs and payoffs at each stage. The cost of implementing loyalty points through email communication consists of development costs and operational costs. A summary of development costs and operating costs for phases I and II is given in Table 3.

Table 3. Implementation Fee Loyalty points through email communication

Phase	Development Costs	Operating Costs
Phase I	6,344.78	1,086.17
Phase II	7,383.4	1,345.85

Meanwhile, the payoff that will be obtained is not in the form of an increase in company revenue but in the form of an increase in efficiency in implementing business process activities. Loyalty points through email communication investments in Petronas Dagangan Bhd have no impact on the company's revenue performance. The benefits detected from the

development of loyalty points through email communication for both stages and the resulting financial value are as shown in Table 4.

Table 4. Implementation Benefits of Loyalty points through email communication

Phase	Benefit	Financial Value (monthly)
Phase I	Cost reduction Telecommunications	1,7620.12
Phase II	Improves responsiveness and speed in Decision making	9,8915.35

Risk Assessment

The implementation of loyalty points through email communication at Petronas Dagangan Bhd has a unique risk of around 80% to 90% based on a subjective assessment of the interview results of ICT Division employees. This figure is obtained from experience and historical data regarding the success rate of application implementation that has been carried out by the ICT Division before. For the implementation of phase I, the success rate (p2) is assumed to be 90%, while the success rate of implementation for phase II (p 4) is 80%. This is because technically the implementation of phase II is considered more difficult than phase I.

Study Results

The calculation results are the ROV produces an NPV value of MYR 38,612,523.37 while the NPV value without an ROV is MYR 37,202,204.86. It can be concluded that the ROV is able to value investments better than NPV without real options.

The calculation of NPV without real options does not consider the flexibility that occurs in investments. The absence of flexibility means that the implementation plan for loyalty points through email communication must be viewed as a whole and does not accommodate any decisions on future investment options. From the beginning, it must be determined whether the company will carry out the implementation of phases I and II, even if they are not simultaneous, or not at all. Thus, the cost of phase II implementation is not multiplied by the unique risk factor as well as operational costs and payoffs. This is because the implementation of phase II is a certainty and the possibility of spending costs in the second year is 100%.

Phase II implementation is not carried out in the first year at the same time as phase I implementation because the IT plan for loyalty points through email communication has determined so to avoid risks too early failure. In ROV, the cost of implementing phase II is calculated by considering unique risk factors such as operational costs and payoffs. This is because the implementation of phase II is still an option and not necessarily executed. The execution of this choice depends on the conditions encountered in the second year.

Another thing that makes the difference between the two calculation results is that the negative risk in the ROV is not considered because it will not be executed. In the case of loyalty points through email communication Petronas Dagangan Bhd this occurs and is described with figure 3 in period 2 ($t<7\leq12$), which is the condition that led to the choice of abandon. In the calculation of the value of A1 above, a negative value of 0.1 is not taken, but

a value of 0 is taken instead. Meanwhile, in the usual NPV calculation the negative value is still considered.

Conclusion

Investment appraisal with ROV is better able to appreciate investment than traditional financial methods, as shown by the results of ROV's NPV in the case of loyalty points through email communication Petronas Dagangan Bhd which is greater than the usual NPV, which is MYR 38,612,523.37 compared to MYR 37,202,204.86. This is occured because ROV can appreciate flexibility in investments that have choices of investment plans in the future.

The ROV method has differences in the case of traded assets and non-traded assets. The ROV parameter for traded assets has similarities with the parameters of financial options where the value of the underlying asset is analogous to the value of the underlying security which is the market price of the invested asset. The volatility of underlying assets is also analogous to the volatility of underlying security, which is the volatility of the market price of the underlying asset invested. This study is supported by (Costanza et al., 2021; Rezaei et al., 2021).

The ROV for IT investments is categorized as a non-traded asset case if the IT investment is not for resale as is the case of loyalty points investment through Petronas Dagangan Bhd's email communication. Due to its non-traded nature, the case of non-traded assets does not have a real market risk, so it only has unique risk as an element of volatility.

The ROV can be modeled with the Black- Scholes model and the binomial model. According to DePamphilis, (2022), model Black-Scholes is suitable for simple option cases, while the binomial model is suitable for compound option cases. This is because the Black-Scholes Model was developed with a paradigm for a single choice so that the parameters of its formula can only have a single value. The Black-Scholes model can be applied to compound options, but this is not flexible because each choice decision-making has its own Black-Scholes formula calculation.

Conflict of interest

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues including plagiarism, informed consent, misconduct, data fabrication and, or falsification, double publication and, or submission, and redundancy have been completely witnessed by the authors.

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References

Alexander, C., Chen, X., & Ward, C. (2021). Risk-adjusted valuation for real option decisions. *Journal of Economic Behavior & Organization*, *191*, 1046–1064. https://doi.org/10.1016/j.jebo.2021.09.011

Ariffin, K. A. Z., & Ahmad, F. H. (2021). Indicators for maturity and readiness for digital forensic investigation in era of industrial revolution 4.0. *Computers & Security*, *105*, 102237. https://doi.org/https://doi.org/10.1016/j.cose.2021.102237

Biancardi, M., Bufalo, M., di Bari, A., & Villani, G. (2023). Flexibility to switch project size: A real option application for photovoltaic investment valuation. *Communications in Nonlinear Science and Numerical Simulation*, *116*. https://doi.org/10.1016/j.cnsns.2022.106869

Costanza, R., Kubiszewski, I., Stoeckl, N., & Kompas, T. (2021). Pluralistic discounting recognizing different capital contributions: An example estimating the net present value of global ecosystem services. *Ecological Economics*, *183*. https://doi.org/10.1016/j.ecolecon.2021.106961

DePamphilis, D. M. (2022). Relative, asset-oriented, and real-option valuation basics. *Mergers, Acquisitions, and Other Restructuring Activities*, 203–228. https://doi.org/10.1016/B978-0-12-819782-0.00008-3

Investment Merits. (n.d.). Retrieved December 16, 2022, from www.affinhwang.com

Khan, F. S., Sultana, M., Khalid, M., Zaidi, F., & Nonlaopon, K. (2023). Forecasting the behaviour of fractional Black-Scholes option pricing equation by laplace perturbation iteration algorithm. *Alexandria Engineering Journal*, 62, 85–97. https://doi.org/10.1016/j.aej.2022.07.009

Penizzotto, F., Pringles, R., & Olsina, F. (2019). Real options valuation of photovoltaic power investments in existing buildings. *Renewable and Sustainable Energy Reviews*, 114. https://doi.org/10.1016/j.rser.2019.109308

Priyadi, U., Atmadji, E., Artiani, L. E., Nordin, S. M., Abdullah, M. R. T. L., Imron, M. A., Wildan, M. A., & Omar, R. C. (2022). Sustainable Energy Economic Policy: Population, Energy Consumption, and Macroeconomic Conditions. *International Journal of Energy Economics and Policy*, 12(6), 80–85. https://doi.org/10.32479/IJEEP.13578

Rezaei, F., Najafi, A. A., Ramezanian, R., & Demeulemeester, E. (2021). Simulation-based priority rules for the stochastic resource-constrained net present value and risk problem. *Computers and Industrial Engineering*, 160. https://doi.org/10.1016/j.cie.2021.107607

Ryandono, M. N. H., Imron, M. A., & Wildan, M. A. (2022). World Oil Prices and Exchange Rates on Islamic Banking Risks. *International Journal of Energy Economics and Policy*, 12(4), 409–413. https://doi.org/10.32479/IJEEP.13360

Zhang, H., Assereto, M., & Byrne, J. (2023). Deferring real options with solar renewable energy certificates. *Global Finance Journal*, 55. https://doi.org/10.1016/j.gfj.2022.100795

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