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REAL OPTIONS AS AN INSTRUMENT OF SUSTAINABLE GROWTH IN BANKING AND PORTFOLIO MANAGEMENT

Abstract: The main goal of the paper is to present various applications of real options in financial institution, especially banks and portfolio management companies, which may use it as an instrument of sustainable growth. Today, real options are a hot instrument applied in different areas and industries. Despite its popularity the application of real option in banking and asset management is not so common. Sections one to six of the paper present different definitions and types of financial and real options as well as their comparison. In addition, the use of real options in different industries, with an emphasis on the banking sector is shown. Sections seven and eight discuss the sustainable growth, its definition and importance, especially in banking and portfolio management industries. Application of the real option as a tool for sustainable growth in the banking sector is also proposed. Section nine concludes the paper

Keywords: banking, real options, sustainable growth, portfolio management, risk management.

JEL classification: G21, G23, G24.

OPCJE RZECZYWISTE JAKO INSTRUMENT ZRÓWNOWAŻONEGO ROZWOJU W BANKOWOŚCI ORAZ W ZARZĄDZANIU PORTFELEM

Streszczenie: Głównym celem artykułu jest przedstawienie zastosowań opcji rzeczywistych w różnych segmentach rynku finansowego, w szczególności w bankowości i w zarządzaniu portfelem, jako instrumentu zrównoważonego rozwoju. Dziś stosowanie opcji rzeczywistych, mimo ich potencjału, nie jest na rynku finansowym tak powszechne. Autor pokazuje, w jaki sposób mogą być one wykorzystane w bankowości i w zarządzaniu portfelem. Rozdziały od jednego do sześciu artykułu przedstawiają różne definicje i rodzaje opcji finansowych i opcji rzeczywistych, jak i ich porównanie. Ponadto ukazują wykorzystanie opcji rzeczywistych w różnych branżach, ze szczególnym uwzględnieniem sektora bankowego. Rozdziały siódmy i ósmy omawia zrównoważony wzrost, jego definicję i znaczenie, zwłaszcza w bankowości i zarządzaniu portfelem. Zaprezentowano w nich również zastosowanie opcji rzeczywistych jako narzędzia zrównoważonego rozwoju w sektorze bankowym i w zarządzaniu portfelem. Artykuł kończy podsumowanie, w którym autor wyraźnie wskazuje na korzyści z wykorzystania opcji rzeczywistych jako narzędzia zrównoważonego rozwoju.

Słowa kluczowe: opcje rzeczywiste, zrównoważony wzrost gospodarczy, bankowość, zarządzanie portfelem.

Introduction

In 1977 Stuart Myers first stated that a real option is a decision opportunity for corporation or an individual. Since that time the literature in this field has been booming. According to many real options have the possibility to improve all sorts of capital budgeting decisions, aligning financial analyses with strategic analyses, by taking future flexibility into account. This paper offers the use of real options in different areas, especially banking and portfolio management as a tool of sustainable growth.

The main goal of the paper is showing how real options may be applied to financial institutions, especially banks and portfolio management companies as a tool of sustainable growth.

First, the financial options, its definitions, and its types will be discussed. Then the paper moves to the real options, including their definitions, limitations, and advantages as well as their classification. Next, ways of applying real options in various industries with some examples will be shown. At the end these will be compared to financial options, using dif-

ferent parameters, similarities and differences. The paper concludes with showing various ways of applying real options in the banking sector and portfolio management. A new approach will be especially concentrated on: a model for selling loans, its goals, and advantages. In addition, the results of decision making when looking through the prism of real options will be presented.

1. Definition of financial options

The most well-known options are options used in finance. According to Geltner et al. (2007) a financial option is a right without obligation to obtain something of value upon the payment or giving up of something else. A person who has that right is an owner or a holder of an option. An asset that is obtained by exercising the option is known as an underlying asset. That what is given up is referred to as the exercise price of an option. A holder of an option has his/her own right to exercise it or not to exercise it.

There are two basic types of financial options: a call option and a put option. A call option gives a holder/buyer of an option the right to buy an asset by a certain date for a certain price. A put option is the opposite: it gives a holder/buyer the right to sell an asset by a certain date for a certain price. The certain date that is specified in the contract as an expiration date (ex-date) or a maturity date. The certain price that is specified in the contract is known as the exercise (ex-price) or the strike price [Hull 2010]. The renewal of the contract will be seen as a call option, because it will give the tenant the option to renew (buy) the contract by a certain date for a certain price. Therefore, all the assumptions, factors, explanations, etc. will be focused on and written from the point of view of a call option.

According to Hull [2010] every option contract has two sides. On the first side there is an investor, who takes a long position (he/she buys an option). On the second side there is another investor, who takes a short position (he/she sells or writes an option). The profit or loss for the writer is the reverse of that for the purchase of the option.

There are three types of the financial options: European, American and exotic ones. The difference between those is in the possibility of the time of exercising the options: European options can only be exercised on the expiration date of itself, while American options can be exercised at any time until the expiration date. Exotic options are a bit complicated: there are

types of options similar to the American options, which can be exercised at any time till the expiration day, or they are similar to the European options, which can be exercised in the expiration date of itself.

2. Definition of real options

Real options are similar to financial options. The difference between both options is that underlying assets in real options are real assets (physical assets). A building or a factory are examples of real assets, whereas the shares of common stock or release from a mortgage debit obligation are assets that are purely financial (Geltner et al. 2007).

The first mention of a real option contract can be found in early 350 B.C.E. in the work of Aristotle (384–322 B.C.E.). In his book named "Politics", Aristotle describes how Thales the Milesian, (c. 624 – c. 546 B.C.E.), a sophist philosopher, divined by his skill in the stars, while it was yet winter, that there would be a bountiful olive harvest in six months. Having little money, he approached the owners of some olive presses in Chios and Miletus, and bought the right to rent their presses at a low rate. He hired the olive presses at a low price because no one bid against him. When a record harvest duly arrived and the olive growers were clamouring for pressing capacity, he rented the presses to them at above the higher price, paid the lower price to their owners, and kept the difference for him – proving for all time that sophism was not only an honourable profession, but a profitable one too.

What is the real option in this story? Thales purchased the right, but not the obligation, to rent the presses. In fact, he purchased a call option, the right to buy or rent. The opposite is a put option, the right to sell. Had the harvest been poor, he would have chosen not to rent, and he would have lost only his original small investment, the price of the option.

The term "real option" originates from the fact that the option's underlying asset is a tangible asset, such as property, a natural resource or even a pharmaceutical one, as opposed to a financial asset, such as stocks or bonds. While the underlying asset may differ from the financial asset, the definition of a real option essentially remains the same to that of a financial option.

The original definition of a real option was first stated by Myers in 1977. According to Myers [1977] a real option is a right, rather than an obligation, whose value is contingent on the uncertain price(s) of some underly-

ing asset(s). In other words, a real option is the flexibility to alter the course of action in a real asset decision, depending on future developments.

Dixit and Pindyck [1994] define real options as opportunities to acquire real assets. Real option investments are characterized by sequential, irreversible investments made under conditions of uncertainty. Dixit and Pindyck [1995] further explain that real options are based on an important analogy with financial options. A company with an opportunity to invest is holding something much like a financial call option: it has the right but not the obligation to buy an asset at a future time.

Copeland and Antikarov [2003] define real options as the right, but not the obligation, to take an action (e.g. deferring, expanding, contracting, or abandoning) at a predetermined cost called the exercise price, for a predetermined period of time, which is the life of the option.

According to Triantis [2000] real options are opportunities to delay and adjust investment and operating decisions over time in response to the resolution of uncertainty. Another research performed by Borison and Triantis [2001] gives us the valuable insight that practitioners have different interpretations of the term "real options". Borison and Triantis [2001] came up with three categories of interpretations, (1) real options as a way of thinking, (2) real options as an analytical tool and (3) real options as an organizational process. In each category, however, corporate decision-making is improved by a better understanding of the role of uncertainty on investments.

Panayi and Trigeorgis [1998] explain that real options involve discretionary decisions or rights, with no obligation to acquire or exchange the value of one asset for a specified value or price. Trigeorgis [1993] explicitly states that managerial flexibility is a set of real options. As he suggests, the use of option-based techniques to value the managerial flexibility implicit in investment opportunities.

And finally, Luehrman [1998] claims that real options capture the value of managerial flexibility to adapt strategic decisions in response to unexpected market developments. Companies create shareholder value by identifying, managing and exercising real options associated with their investment portfolio. The real options method applies theory of financial options to quantify the value of management flexibility and leverage uncertainty in a changing the world.

3. Classification of real options

There are different ways we may classify real options. The most important and clear classification of real options is presented by Panayi and Trigeorgis [1998]. They divide real options into two categories (see Figure 1): those without strategic value, which are cash-generating and are (usually) structured and so-called simple options as well as those with strategic value, which are not cash-generating and are (usually) structured and so-called compound options. This classification uses similarities between real options and financial options.

A single option is used throughout the life of the project or investment. A compound option can be described as an option on an option. It can be two or more simple options. There are two types of compound options:

– simultaneous compound option – created during the life of the second option, both options are alive simultaneously,
– sequential compound option – the second option is created only when the first option is exercised.

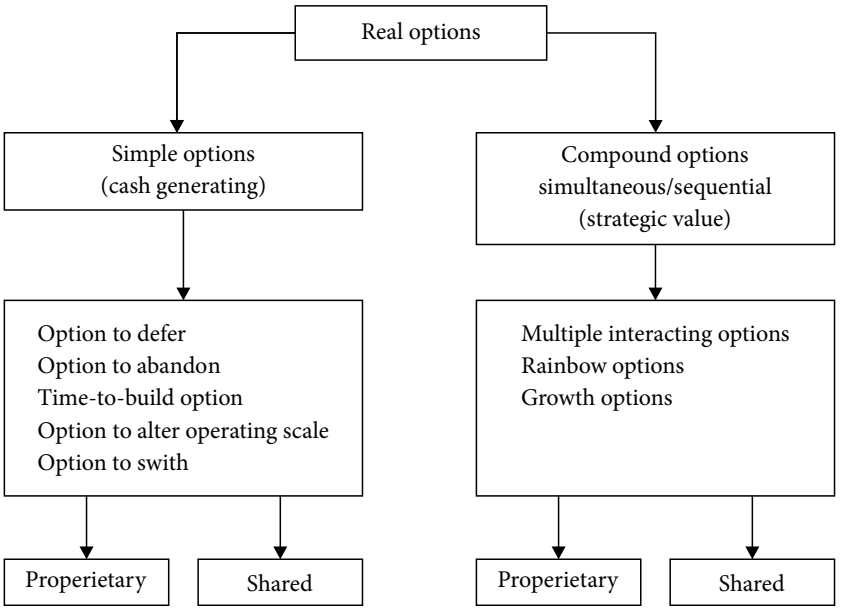

Figure 1. Classification of real options

Source: Panayi and Trigeorgis [1998]

Proprietary real options are opportunities that are held by one company only. In contrast to proprietary real options shared real options are opportunities that are jointly held by a number of competing companies or even an entire industry, and can be exercised by anyone of the collective owners. Examples of the classification of real options are listed in Table 1.

Table 1. Examples of different types of real options

Simple proprietary real option	a government concession to develop natural resources or a potential expansion of capacity to produce a unique product protected by patents.
Simple shared real option	number of potential expansion decisions in competitive industries.
Compound proprietary real option	exploration investments protected by government licenses.
Compound shared real option	a pilot project proving the market and creating customer acceptance.

Source: Damodaran [2005].

Trigeorgis [1999] groups simple real options into the following classes:

- Option to defer (learning option) – this includes options where the time point of an investment is not determined but flexible allowing this time point to be optimized. Those options can also arise from changes in the term structure of interest rates over time even if the future cash flow is deterministic.
- Option to abandon (put option, insurance) – this is an option to sell a project. The value that can be regained by selling the project (salvage value) is included in the pricing of the project and can substantially alter the project's NPV calculation.
- Time-to-build option – this is an option that allows to stop a step-by-step investment within a project if market conditions turn unfavourable. Such an option is particularly valuable in R&D.
- Option to alter the operating scale – this is an option to react upon a changing market and to expand operations (favourable market conditions) or to scale down operations (unfavourable market conditions). Such an option can be implemented when a firm wants to introduce a new product or would like to enter a new market, for example in the consumer goods industry.

– Option to switch – this option comprises the possibility to react upon changed market conditions by changing the input and output factors via input shifts and/or output shifts. This is a classical real option.
– Growth option – growth options are strategic options. They are particularly relevant for projects which are not advantageous in themselves but may generate lucrative opportunities in the future. This type of option can especially be found in R&D. In the pharmaceutical industry, e.g., it takes more than ten years for a product to develop from the original idea to the final product with a success probability of only a few per cent. However, during the course of a project the original investment may generate various other applications which are profitable and generate a positive NPV for the whole investment.

According to Trigeorgis [1999] compound real options can be:

– Multiple interacting options – they are combinations of real options of the types described above. In practice, they are the most frequent ones.
– Rainbow options – those are options driven by multiple sources of uncertainty, where the option value is dependent on two or more underlying variables, e.g. price of a unit of output and the quantity that might be sold [Copeland and Antikarov 2003].

All types of the real options listed above can be grouped into call-like options and put-like options. A call-like option is an opportunity to increase a part of the investment. This type of real option has the same characteristic as a usual financial call option, as shown in the Figure 2.

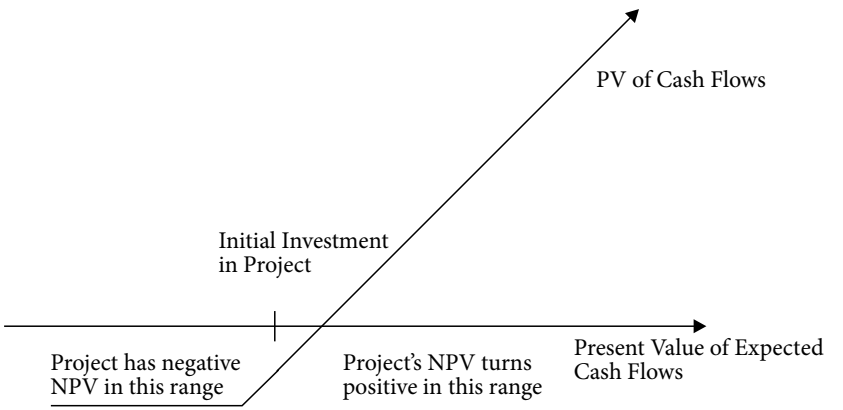

Figure 2. Call-like real option

Source: Damodaran [2005]

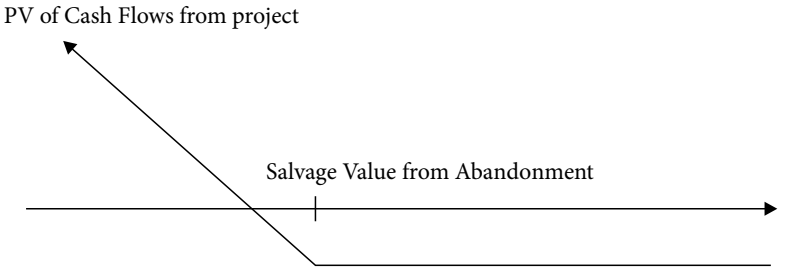

Figure 3. Put-like real option
Source: Damodaran [2005]

A put-like option is an opportunity to reduce or to abandon/to defer the investment. This type of real option has the same characteristic as a usual financial put option, as shown in Figure 3.

4. Comparison of real options and financial options

The most well-known option is an option used in finance [Roodhof 2012]. Real options have started to receive corporate attention only in the past three decades [Mun 2006]. Financial options are daily used and traded on financial markets. Therefore, they are very recognizable. Real options are harder to recognize.

There are similarities and differences between real options and financial options. They both give the right to buy or sell an asset at a certain price. Like in financial options the value of real options depends on five basic variables (although others may come into the picture), plus an important sixth one [Copeland and Antikarov 2003]. The five basic variables are:

1. Value of the underlying risky asset – in the case of real options this is a project, investment or acquisition. If the value of the underlying asset goes up, so does the value of a call option. One of the important differences between financial and real options is that the owner of financial option cannot affect the value of the underlying asset (e.g., a share of any company stock). But the management that operates a real asset can raise its value and thereby raise the value of all real options that depend on it.
2. Exercise price – this is the amount of money invested to exercise the option if any person "buys" the asset (with a call option), or the amount of money received if a person "sells" it (with a put option). As the exercise

price of an option increases, the value of the call option decreases and the value of the put increases.
3. Time to expiration of the option – as the time to expiration increases, so does the value of the option.
4. Standard deviation of the value of the underlying risky asset – the value of an option increases with the riskiness of the underlying asset because the payoffs of a (call) option depend on the value of the underlying asset exceeding its exercise price and the probability of this increases with the volatility of the price of the underlying asset.
5. Risk-free rate of interest over the life of the option – as the risk-free rate goes up; the value of the option also increases.

The sixth variable is the dividends that may be paid out by the underlying asset: the cash outflows or inflows over its lifetime.

There are important differences between both types of options. Brach [2003] compares parameters that determine the value of both options. The table below shows the differences in parameters describing real options and financial options.

Table 2. Parameters of financial options and real options

Financial Options	Varible	Real Options
Spot price	S	Discounted future cash flow of the asset
Strike price	K	Cost to buy the asset (investment)
Time to expiration	T	Option term
Volatility	Σ	Risk of the asset (difference worst case, best case)
Risk free rate	r_f	Risk free interest rate (time value of money)

Source: Brach [2003].

For financial options S means the spot price (price of the share). With real options this can be compared to the discounted value of the total future cash flows of the project. It can be calculated with the traditional discounted cash flow method. In fact, this is the value of the asset at time 0.

K is the strike price of financial options and is predetermined most of the time. In the case of real options K can be seen as the investment that has to be made to exercise the option. In contrast to financial options the amount of the investment is often insecure with real options. So, in practice, it is the investment that has to be made to get the option.

The time of the option, t, is for both financial options and real options the time in which it must be exercised. From that point of view real options

seem more like American options because the point of time when the option must or can be exercised is not predetermined.

Volatility, σ, is seen as the future degree of uncertainty. Both for financial and real options, a higher volatility leads to the higher premium of the option. The possibility that the price of a stock will increase is greater, because the down side risk is covered up to the maximum loss of the premium.

The r is the risk-free interest rate, and for both options this has the same meaning and content. An increase of the risk-free interest rate will have a positive effect on a financial call option and a negative effect on a financial put option. For a real option is it important to understand what kind of effect the change of the risk-free interest rate has on its operational activities[1] [Engels 2002].

In addition, it is possible to distinguish real options from financial options according to the criteria shown in Table 3.

Table 3. Comparison of real options and financial options

Specification	Real options	Financial options
Potential and strike price	complex	easy
Trading	not traded	daily
Timeline	fixed and known	flexible
Liquidity	limited	high
Underlying asset price	not always available	always available and clear
Viewpoint	management tool	contract
Exercising	no market changes	changes will be in supply and demand

Source: Roodhof [2012].

As far as the potential and strike prices are concerned a big difference between financial options and real options is the character of the underlying asset. The underlying asset with financial options is financial (not physical), the underlying asset with real options is physical. With financial options, it is more about the difference between the potential and the strike price. In the case of real options the environment is more complex than in financial options. For example, technological and market developments,

[1] Operating activities refers to a company's core business activities, such as manufacturing, distributing, marketing and selling a product or service. Those activities should provide the majority of a company's cash flow and largely determine whether a company is profitable or not.

management competences and others, will have a greater influence on the value of the real option than the financial option.

Financial options are traded on a daily basis, so the information on valuing options and decision making (to hold or to exercise) is available at any time. This is not the case with real options [Copeland and Tufano 2004]. Real options are not traded on a daily basis, therefore, valuating decision making is more difficult. In fact, real options are created when an investment or a project is created. When the investment or the project is sold, it being sold together with real options.

The concept of the timeline is another difference. In the case of financial options the expiration day is pre-set and known. With real options the timeline is not so clear. The moment of the exercise will result in another option or exclude other options, so options have and will influence each other reciprocally. A long time can pass between the exercise point of an option and the financial effects of this action. During the projects realization, new information can emerge that could cause changes on the market.

There is a difference in liquidity between real options and financial options. Financial options are easy to trade on financial markets. Real options are quite difficult for trading. Therefore, their liquidity is limited.

Shares are traded every day; therefore the price of an underlying asset is always available and clear. In the case of real options the value of an underlying asset is not always clear. The reason for this is that real options are not traded on a daily basis.

The financial option is a contract between two separate parties: an option holder and an option writer. The real option can be seen as a management/risk management tool for project controlling and monitoring. For the holder of an option a real option creates flexibility. That flexibility can be used for continuing new insights or changes that can occur in the market and may influence future cash flows. Real options can be described as opportunities that the management in the future holds on to. With financial options this opportunity is the right to sell or buy common stock for a predetermined price. With real options, for example, the opportunity is the possibility to delay an investment or the possibility to launch a new product.

In terms of supply and demand, when the financial option is exercised, the market does not change. The reason for this is that when a financial option is exercised there will be no larger numbers of shares on the market. When a real option is exercised changes will be seen in terms of supply and demand.

Financial options are a zero sum game: holders lose are writer's profits. Also, when a financial option is exercised, there is no added value. When a real option is exercised, there is the possibility of an investment. This creates added value [Witvoet et al. 2007].

5. Application of real options in banking

The business world has also discovered the benefits and contribution of real options. Table 4 shows different industries in which real options may be applied.

Table 4. Application of real options in various industries

Industry	Growth option	Flexibility option
Pharmaceuticals	research and development	outsource production or sales
Oil & gas	lease blocks	delay production
Power	global expansion	peak generating plants
Computer hardware	new model under brand name	assembly configuration
Financial services	IT infrastructure	abandon service or divest
Airline	aircraft delivery options	contingency rights
Real estate	undeveloped land	redevelop with adjusted mix
Telecommunications	mergers and acquisitions	re-deploy
Internet	marketing investments	outsource services

Source: Rogier [2013].

The real option in banking is a derivative tool which is not traded on the public market, but is directly connected by the cost with an asset which, on the contrary, is traded or can be traded in the public market. The ability to use the control mechanism for options gives the possibility to manage the risks and opportunities of banks. Many processes in commercial banks can be determined also through the lens of real options. For example, investment or the development of Information Technology (IT) can be seen as call options, providing banks with new opportunities. Information Technology includes all hardware and software that a firm needs to use in order to achieve its business objectives. It can be explained in a business context as set of interrelated components that collect or retrieve, store, and distribute information to support decision making and control in an organization [Laudon and Laudon 2010]. Information Technology (IT) has

been defined by Ige [1995] as the modern handling of information by electronic means, which involves its access, storage, processing, transportation or transfer and delivery. Langdon and Langdon (2006) also define IT as a set of interrelated components that collect or remove, process, store and distribute information to support decision making, coordination and control. Technology banking is defined as the automated delivery of new and traditional banking products and services directly to customers through electronic, interactive communication channels [Sathye 1999]. Technology banking also includes all the systems that enable financial institutions and customers to access accounts, transact business, obtain information on financial products and services by technological means. Laudon and Laudon [1991] argued that managers cannot ignore Information Systems because they play a critical role in contemporary companies. Well-known examples of Information Technology in banking that are frequently used in daily life are: Automatic Teller Machine (ATM), Internet Banking, Branch Network, Telephone Banking (TeleBank) and Mobile Banking Applications. Such technology allows viewing account balances and transaction histories, paying bills, transferring money between accounts, requesting credit card advances, requesting, or repaying loans, and ordering checks for more faster services that can be provided by domestic and foreign banks. Thanks to technology, a range of traditional banking services made available for customers twenty-four hours a day, seven days a week, have eliminated the need to get to a branch. Technology has lowered the cost of processing financial transactions, making it profitable for financial institutions to create new financial products and services for the general public. It has made it easier for investors to acquire information, thereby making it easier for firms to issue securities and it has resulted in many new financial products and services in Europe and other countries [Mishkin and Eakins 2009].

The popularity of the application of real options in IT banking is caused by technological developments. Using a real option in this area is like using real options in research and development (R&D). For example, when a bank wants to upgrade ATM's it can replace all ATM's simultaneously. However, such a project may fail. Another way is by using real options. Banks can divide the project into stages (time-to-build option). In the first stage a bank can install new ATM's in a certain area for a certain period of time. By this way, it is possible to learn about the risks of the project. When this phase is successful, the upgrade can be extended to other areas gradually, until the end of the project. No doubt that the banks must be ready for changes in market conditions (option to switch). For example, if a payment

by smart phones gains some attention and thus reduces the need for ATM's, banks will have to adjust to their clients (create custom software development, etc.). At every stage of the project banks must keep their options to leave the project, in case if the project fails (option to abandon).

Banks may also use real options for loans. For example, a company wants to take a large loan from a bank for a new project. The company may have a brilliant idea, but the bank has always a risk that a borrower will not return the loan. In order, not to endanger the loan, banks can wait for more information about that project, and only then decide whether to give the loan or not (option-to-defer/learning option). By this way banks can learn about the risks of the project and the company. Also, banks can divide the loan into small parts, when receiving another part of the loan then it must carry out the terms of the previous part of the project successfully (staging option). Moreover, a bank can sell the loan after giving it. In what conditions would a bank be prepared to sell the loan? This condition is written in the equation below:

$$P = NPV + \Pr, \tag{1}$$

where:

P is price of loan, NPV is a cash flow of the loan, and Pr is a premium.

The gain of the bank in this case is that it reduces risk and releases funds for other activities. In payment of a *premium* a bank could see compensation for waiving future income from selling the loan. Also, a premium can be explained by reducing the risk. For example, the bank will not sell a loan immediately after giving it to a borrower. At the start point there is a risk that a borrower will not return the loan. As time passes and a customer repays his/her loan, the risk that he/she will not return the full amount of a loan is being reduced. In addition, the loss in case a borrower fails to repay the loan goes down also. What do the buyers of a loan (investors) earn? The loan buyers (investors) will get the loan returns that were paid to the bank. Additional royalties also can apply. The idea behind the *premium* is similar to a financial option, to allow the loan buyer, within a predetermined period of time, to decide to buy a loan or not.

The use of real options for bank loans has been the subject of scientific research. Choi and Smith [2002] compared the traditional use of real options with the one in commercial bank lending (Table 5). They created and tested a real option model for a lending decision. This real option model indicates

that uncertainty regarding interest revenue and loan expenses influences the lending decision in addition to the expected net margin loans. Also, they show empirical evidence that the greater uncertainty, the lower the loan activities. In addition, they prove that the correlation between interest revenue and loan expenses affects the value of waiting on a loan decision. The real options theory suggests that the level of investment risky assets (e.g., loan portfolio) will be lower (higher) due to the "value to wait" for loan decision with greater (less) uncertainty, given the same expected return on loans. In other words, when the level of uncertainty in providing a loan is high, banks should wait with the decision to grant a loan or reject it. Maybe in the future they would get new information that would change the level of uncertainty [McDonald and Siegel 2002]. Their results are consistent with the observation that when banks increase one type of risk, e.g., interest risk, they decrease another type of risk, i.e. lending risk, as measured by loans/assets. The model of Choi and Smith [2002] further suggests that since the degree of the correlation between assets (loans) and liabilities (funds) in banking depends on maturity and duration gaps between loans and the liabilities funding them, the value to wait to make a loan decision should depend on those gaps.

Most growth opportunities share a common feature: uncertainty. In today's economy strategic investment must be made without a pinpoint forecast of the future [Amram and Kulatilaka 2000].

Table 5. Comparison between the traditional use of a real option and its application in banking

Parameters/environment assumptions	Traditional use of real options*	Use of real options in banking
Underlying assets	gas (stochastic prices)	loans (stochastic prices)
Exercise Price	initial investment (constant or stochastic)	funds to support (stochastic)
Uncertainty	variance of gas prices variance of investment costs correlation between gas and investment cost	variance of loan prices variance of funds prices correlation between loan and funds prices
Exclusive right to exercise	varies (depend on sequential investments and market development)	varies (depends on loan type and related application fees, current banking relationships and market developments)

* Refer to Pindyck (1990), Sick (1995), Trigeorgis (1996), and Dixit and Pindyck (1994) for an excellent survey of the literature.

Source: Choi and Smith [2002].

Another example is the condition of the return redemption of agreement obligations which for banks is non-core in its activities can be seen as the sold put the option and one purchased call option for liabilities.

The possibility of a credit bonus for the client can also be an option. For example, the purchase of a car with a credit card can be considered as an option issued by a bank to a client. In fact, it may be seen as a put option with a strike price – the car price. If the debt exceeds the franchise on a car, the bank closes the option.

The current assets can be also considered as options. The liability from the client to pay one million dollars within seven days in case of the risk of a default of equal zero per cent does not contain the option. The same liability, but with risk of a default, even in the presence of providing already has an option component. If net assets value is lower than the amount of liabilities, in this case it is possible to provide a loan. This can be seen as a long-term put with strike price in the amount of net debt.

The deposit or share on securities depending on security quotations can be also seen as the option with delay of execution which cost changes depending on the volatility of the market and the demand for a product.

In strategic decisions a product line is similar to real options or contain similar lines. As discussed before, real options are not traded; these are created with the investment. Real options which are owned and used by a bank create essential value for its shareholders. On the other hand, real options in which a bank is a subscriber are a source of risks and instability, by analogy to the financial options.

Built-in options can be found in banking products. Retail banks usually use more the liabilities for the funding of the credit products of physical persons. However, for large banks it makes sense to use external borrowings for the crediting of physical persons. In this case bank assets and liabilities can have lines, similar to real options. If the bank sells or pledges shares, here it is already possible to estimate the option since it is derivative of the financial instrument. For example, if the bank buys the bond which is subject to the return redemption, then it is possible to look at it on how a debt and the built-in call option with an interest return rate which belongs to bank and on the contrary the sold bond is the call option sold by the company.

Private and small investors, who have weaker tools to trade financial options and futures, usually give the right to banks. It is just visible with the example of those products when a bank offers a deposit product with the binding of an interest rate to the price of this or that share. At the expense

of it the bank removes from itself risks of an overpayment of per cent if the stock market begins to decrease. It can be seen that the bank has the call option in the stock market. In the case of market growth, the bank pays expenses due to the choice of a similar strategy. A similar strategy is very effective since the bank has always enough space for manoeuvre at the rate and risk of an overpayment of real per cent, in the case of the change of an environment in the market is absent. On the other hand, the client also has the right to obtain additional profit if the market grows.

A similar situation arises also with credit products. In this case if the interest rates go down, the borrower always has an opportunity to refinance the credit that will allow saving on per cent. In general, it means that the holder of a mortgage always has the call and a put option. The call option allows obtaining the new credit or to refinance it. The put option allows repaying the credit at the expense of refinancing. In this case, it is necessary to expect strikes of options, i.e. prepayment penalties.

6. Definition of sustainable growth

According to many, a company's maximum long-run growth rate is equal to sustainable corporate growth [Fonseka et. al. 2012]. Huang and Liu [2009] stated that the financial idea of sustainable growth means that the actual growth of the firm must be harmonized with its resources and the accelerated growth or slower growth induced by the company's financial or survival crises respectively. A higher growth rate above the SGR rate can create many problems for a company and it is not healthy in the long-run. It may overload the companies due to the inability to manage and control as well as deteriorating their financing capabilities. The SGR is the threshold limit for corporate growth and it may indicate that the management of a company will stop its growth or where they can increase the SGR [Raisch and VonKrogh 2007].

The SGR is the maximum rate of growth in sales that can be achieved at the given profitability, asset utilization, desired dividend payment and financial leverage of the company [Higgins 1977]. The sustainable growth rate is also defined as the maximum rate at which it can grow without changing its operating and financing policies. The SGR can be increased by improving its operating and financial performance. According to the Platt, Platt et Chen [1995] sustainable growth is defined as the rate at which a company's sales and assets can grow if the company does not issue new

equity and the wish to maintain its capital structure. According to the theory of sustainable growth, SGR analysis identifies the target growth rate at which these pressures arise and this unrestrained growth leads to less than optimal performance and/or financial distress.

The sustainable growth rate represents how quickly a company can expand using only its own sources of funding. A company's sustainable growth rate (SGR) is expressed mathematically in the following way:

$$SGR = \frac{earnings\,after\,dividends}{begining\,stockholder's\,equity}, \tag{1}$$

Importance of corporate planning and the creation of models for receiving business solutions were studied by Naylor and Schauland [1976], Traenkle, Cox and Bullard [1975], Grinyer and Wooller [1978], Hamilton and Moses [1973]. In research authors fairly indicate the needs of the accounting of such a factor as subjective judgment of the manager participating in the creation of strategic forecasts. They distinguish the determined and probabilistic, descriptive and optimization forecast models. In practice, they give preference to the determined models which are based on cause and effect relationships between indicators. Hayes and Nolan [1974] studied distinctions between the models created „from top to down" by disaggregation of corporate purposes and the models „from below-up" created by aggregating. As authors specify, forecast models shall be created „from top to down" as in these conditions there is a general strategic model reflecting the main investment strategy of development.

According to Marris [1964] the purposes of managers and owners differ: the first are interested in the increase in the size of a company, its power and its reputation in the markets (e.g., growth of sales), and the second – in their own welfare and dividends (e.g., profit increase). These two purposes do not contradict each other, and are interconnected among themselves. Baumol [1959] assumes that to managers, meeting the requirements of shareholders is enough to provide the minimum acceptable and stable profit level during a long period of time. Banks and other financial institutions consider the growth of sales volumes as a good indicator of the effective work of a firm.

Kisor's model [Kisor 1964] and the model of Lerner-Carleton [Lerner and Carleton 1966] presented in formulas (2) and (3) are considered as the simplest models of the growth of a firm:

$$SGR_y = (1-d) \times ROE, \tag{2}$$

where: d is the coefficient of dividend payments and ROE is return on equity.

$$SGR_y = b(1-T)\left[r + (r-i) \times \frac{L}{E}\right], \tag{3}$$

where: b is the coefficient of reinvestment profit, T is tax rate, r is return on assets, i is the interest rate for the loan capital, L is the amount of the company's liabilities, E is equity.

Ulrich and Arlow (1980) developed a model which is presented in a formula (4):

$$SGR_y = \left(\frac{NI}{S}\right) \times \left(\frac{S}{TA}\right) \times (1-P)\left[1 + \left(\frac{D}{E}\right)\right], \tag{4}$$

where: $\frac{NI}{S}$ is sales profitability, $\frac{S}{TA}$ is assets conversion cycle, $(1-P)$ is the profit reinvestment ratio, $\frac{D}{E}$ is the loan to equity ratio.

Rappaport [1986] and later Higgins [2007] demonstrated that the planned rate of a surplus of sales determines the capabilities of the entity to achieve effective objectives, using the available resources. Strong growth is the maximum speed with which the company can increase sales without emptying its financial resources. Higgins assumed that the rates of the strong growth of a company are no other than the growth rates of its equity. Higgins's model has a static appearance, thus, in modern market conditions it is inapplicable. Rappaport's model reflects the dependence of growth rate on financial coefficients, as is presented in formula (5):

$$SGR_y = \frac{b \times M \times \left(1 + \frac{D}{Eq}\right)}{\frac{A}{S} - b \times M \times \left(1 + \frac{D}{Eq}\right)}, \tag{5}$$

where: $\frac{A}{S}$ is the ratio of total value of assets to revenue from sales, M is

the net profitability, $\frac{D}{Eq}$ is ratio of borrowed to own funds, b is the profit reinvestment ratio.

Van Horn (1996) based his model on Rappaport's model. His model takes into account new inflow of financing and it is presented in formula (6):

$$SGR_Y = \frac{\left(Eq_0 + Eq_n - Div\right) \times \left(1 + \frac{d}{Eq}\right) \times \left(\frac{S}{A}\right) \times \left(\frac{1}{S}\right)}{1 - \frac{NP}{S} \times \left(1 + \frac{D}{Eq}\right) \times \left(\frac{S}{A}\right)} - 1, \tag{6}$$

where: Eq_n is amount of the attracted equity, Div is the amount of dividends, $\frac{S}{A}$ is the assets conversion cycle.

Zakon [1986] developed a model that used the generalizing indicators of profitability of an interest rate of the loan capital, as is presented in formula (7):

$$SGR_y = \frac{D}{Eq} \times \left(ROA - i\right) \times p + ROA \times p, \tag{7}$$

where: $\frac{D}{Eq}$ is a ratio of borrowed to own funds, ROA is the return on assets; i is the interest rate, p is the reinvestment ratio.

The model of Gulati and Zantout [1997] is based on the assumption that the fixed growth of a company is provided with the investment decisions dependent on the consequences of inflation and interest rate fluctuations that without fail leads to a change in capital structure. Also, in the model restriction on the occasion of equal inflation rates in the markets of products and the raw markets is excluded. This model has a difficult and complex formula as is presented below:

$$SGR = \frac{mS - D + i(1-T)S + j[I + F - T(k+u)F - (1-T)]S - (e)(\alpha)(1-T)[\beta_1(C + I - L) + \beta_2(F)](S)}{[(1-\beta_1)(C + I - L) + (1-\beta_2)(f)](S)}, \tag{8}$$

where: m is profitability on a net profit, S is sales, C is the ratio of money and receivables to sales, L – the ratio of liabilities to the sales, I is the ratio of the amount of inventories to sales, F is the ratio of the residual cost of a property, plant and equipment to sales, k – the expected depreciation rate, u is annual and not the predicted depreciation rate, β_1 is a per cent of new current assets which are financed by loans, β_2 is a per cent of a new property, plant and equipment which are financed by loans, D is the amount of dividends; T is the rate of the income tax, α is the per cent from the liabilities of the company which have a floating interest rate; i is the annual rate of inflation in relation to the prices of the products of a company, j is the annual rate of inflation in the prices of acquired goods, raw materials, materials, e – the adjustment of interest rates in connection with inflation or other factors.

7. Sustainable growth in banking and portfolio management

Stewart Myers first introduced the concept of real options in 1977. He divided assets into two various categories which he called the main objective: „the operating assets" and „future opportunities of growth". The value of bank assets at any point is the amount of market values, the operating assets and future opportunities. A major factor which divides these assets are that the operating assets depend on investment expenses which were incurred earlier, and future opportunities on the contrary reflect future investment expenses. As investment expenses happen in the future, a firm cannot reach project indicators to the necessary date therefore only in the future is it possible to estimate the project as net present value.

Since the financial market, and especially banking sector, has unique characteristics, so far it has not paid enough attention to real options. Real options may not be adapted to all types of the activities of banking. Their application to IT Banking is the most common at the moment but it seems not to be enough. There are other areas of activities of banks in which they may benefit from the advantages of real options and use them as a tool of sustainable growth.

The option for future opportunities is today's right to investments in the future. In other words, the possibility of growth is an opportunity to make a later investment into a project. For example, for a bank the growth option is an opportunity on the expansion of its retail departments, the option of the acquisition of a new portfolio of mortgage loans, the option for the start

of business in networks, online services, the conclusions partner programs or agreements. All this has begun to give a return later to a certain period of time.

The possibility of growth for banks can be provided as an option consisting of the following: first, not always it is possible to estimate the quality of the possibility of growth to participants of the market; thus, banks not always begin directly to finance the possibilities of growth. Secondly, the availability of a possibility of growth is critical for risk management.

In fact, most parts of investment opportunities are possibilities of growth which can be considered as call options on real assets with a strike price, equal to a future amount of investments which are necessary for the acquisition of an asset.

Why is sustainable growth particularly important in banking? This can be explained with the example of a marathon runner. On one hand, if a marathon runner in a race starts running quickly; he/she will use up all of his/her energy and may not finish the race. On the other hand, when a person runs slowly, indeed he/she will finish the marathon race, but not as the winner. It is clear that both results are undesirable. However, if a person runs at a reasonable rate, accelerates, or slows down the run rate by his/her own abilities, he/she can finish the marathon successfully, and there is a chance to win the race. In the case of banking it is same: if a bank starts to grow rapidly, it may use up all of its own resources. The lack of resources can prevent any future activities. From the other side, the slow growth of a bank can leave it far behind its competitors. Both results are risky and undesirable, because it can cause financial losses, and a sharp increase in debt. Also, it can lead to crises such as a decline of market share and loss of employees, or even bankruptcy, and, as result, all of the undesirable effects listed before (e.g., decrease in outlay levels, reduction in economic growth, and increase in unemployment).

Sustainable growth is strategic, forward-looking, and exponential [Crosley 2013]. However, growth is beneficial only up to a certain level [Fonseka et. al. 2012].

Sustainable growth rate is a useful tool to a bank to determine the creditworthiness of a company. The gap between the actual growth rate to its sustainable growth rate will indicate that a company needs and looks for funding sources for its growth. Further, it helps a bank to understand why a loan seeker needs money and how long the need will continue. The sustainable growth rate models help banks to explain to financially inexperienced small and medium companies, why it is necessary to keep a proper balance between a company's growth and profitability [Higgins 2007].

The examples shown below prove that banks can apply real options as a tool for sustainable growth. Sustainable growth is a priority for all businesses, including small business owners, and the managers of large corporations. We must be aware that it is not easy to achieve this goal in the banking industry given the rapidly changing political and regulatory, economic, competitive, consumer trends, technological developments and more. All those trends pose unique challenges for decision makers looking for sustainable growth. Customer expectations, for example, have changed significantly over the last few generations. This fact, along with the legacy of a decade of quality and cost reduction programs, makes banks try to attract customers by redefining value for customers and by competing with their competitors and improving their value.

Options on abandonment are usually popular in financial sectors. Even a small decrease in requirements can lead to the liquidation of an investment idea. For example, the minor change of a credit risk or interest rates can lead to the fact that a bank will want to sell a part of the credit portfolio. By using this type of an option, banks can get rid of bad and unprofitable projects or products and thus release and redirect resources to good, profitable projects or products. This move will have a positive impact on the sustainable growth of a bank.

Time-to-build options (staging options): traditional decision making in investment based on tools such as NPV, DCF and over. Copeland and Antikarov [2003] and Trigeorgis [1999] determined that those traditional tools give inaccurate results, because they do not consider the possible changes that may occur in the future. Therefore, it became necessary to develop an instrument that considers the uncertainty of the future. To illustrate this argument, I want to use the following example:

Let us suppose a bank is going to invest in the operation of the production line of new products. The project is calculated for two years. Initial investments totalling $150,000 are necessary to complete the project preparation phase lasting one year. $100,000 more is needed to be invested the following year – with the beginnings of production. It is expected that the cash flows arising from the sales of new products will enter the bank's disposal at the end of the second year since the start of the project. However, now it is difficult to determine whether a new product will be in demand on the market. Inheritance positive probability of events (expected income will be $400,000) makes 65%, and negative (expected income – $40,000) – 35%. Rate of return, r is 10%.

Letus calculate the NPV, using the standard approach:

$$NPV = (-150) + \frac{(-100)}{(1+0.1)} + \frac{400 * 0.65 + 40 * 0.35}{(1+0.1)^2} = -\$14,46 thousand < 0, \quad (9.1)$$

Net present value of this investment is less than 0. In other words, this investment is not profitable. Thus, according to the NPV criteria decision, it would be logical to abandon this investment.

Now let us suppose that in a year it will become clear whether there is the new product demand in the market. Thus, it will be able to decide whether to continue to invest. In the event of adverse changes it would be advantageous to stop the investment. Let us calculate the NPV now:

$$NPV = (-150) + \frac{(-100) * 0.65}{(1+0.1)} + \frac{400 * 0.65 + 40 * 0}{(1+0.1)^2} = \$5,785 thousand > 0, \quad (9.2)$$

Now net present value is positive, therefore, this investment is profitable. According to the NPV decision criteria, this investment can be recommended for execution. In practice, if a company wants to accept the project with a negative NPV, such a decision is called „strategic". In this case, by using staging options a bank can accept projects that appear not too profitable, but in the future they can yield income.

The Option for delay investment can be found in IT Banking. Such an option can prevent a number of problems in the future, if created, therefore, any situation where the project can fail, must be supported by the availability of the option. The option for the delay of investments is more valuable when assets are purchased step by step and can be resold at any time. Step by step investment decisions at different levels gives banks the great opportunity for manoeuvre in case of project management. The space for manoeuvring is extremely necessary for bank growth.

The Option to switch is the option on the change of a product line. The option on switching can belong or to switching of the entering or outgoing business processes. If market demand for a product has increased, the bank will perform additional investments to expand the opportunities.

A growing and dynamic banking sector is essential for economic growth for each country. It can provide easy access to credit, which would encourage a greater level of private sector investment and consumption, which in turn, would boost economic activity and lead to a greater level of employment. Without a strong, progressive, and dynamic banking sector, availability and accessibility to credit would not be possible due to which consum-

ers and companies would not be able to finance their needs. This would lead to an undesirable effect, resulting in outlay levels decreasing, a reduction in economic, and an increase in unemployment levels. For example, along with a mortgage or loan for a new car, banks can offer suitable insurance policies. Such a process will strengthen the competitive advantage of a product, and minimize risks which banks take, in the case of crediting. For the provision of cross-products it is not necessary to perform additional expenses at all. On the other hand, there are a number of the problems connected with the back office and the servicing of these kinds of transactions that increases the accounting part.

Additionally, the option on switching can be realized in the case of the closing of crediting limits on this or that product or the client.

Growth options: another version of the earlier option to expand of great strategic importance are corporate growth options that pave the route of future opportunities [Trigeorgis 1993]. Growth options are found in all infrastructure-based or strategic industries, such as the natural resource industry [Trigeorgis 1999], but in this paper, I want to show the possible application of such growth options in the banking sector. Let us suppose that a bank is considering the possibility to develop a new application, based on new superior technology, developed, and tested internally on pilot users. From one side, this application may appear unattractive, because nobody knows if the new technology will be in demand on the market. But, from the other side, it could be only the first step in the series of applications and its upgrades if the process is successfully developed and commercialized, and may lead to an entirely new useful application. For example, many early investments (e.g., a strategic acquisition, market research and new products development or new technology) can be seen as early conditions or links in a chain of interrelated investments. The value of these investments derives not so much from their expected cash flows, but rather from unlocking future growth opportunities (e.g., a new generation of products, access to a new or expanding market, strengthening of the firm's core capabilities or strategic positioning). By calculating the profitability of this investment, a negative NPV may appear (equations 9.1 and 9.2). But the experience, infrastructure, and potential products generated during the development of the first-generation product may serve as springboards for developing the next generations of the product in the future, or even for generating new uses of the product into other areas. Without that initial investment, subsequent product generations or other uses cannot be feasible. The experience and infrastructure gained can be a company's proprietary and can

make the company more competitive (competitive advantage), which may help to reinforce itself. Growth options can provide a bank with additional opportunities, such as new markets. New opportunities will thus provide future growth for the bank.

Mergers and Acquisitions: in estimating a firm for acquisition, not only the revenues and cash generated from the company operations must be considered but also the strategic option that come with the company [Smit and Moraitis 2010]. In fact, in mergers and acquisition, there are several types of real options, as can be seen below:

- option to expand: if the company is highly successful, it can be evolving into other industries or new products and services that can be developed through the exercising of an option to expand;
- option to abandon: if the acquired company does not exceed a buyer's expectations it can be executed where it can be sold for its tangible assets and intellectual property (e.g., patents). a company acquires another company for increasing its existing portfolio of products or geographic location or to obtain new technology (option to expand), or to divide the acquisition into many smaller companies and sell them as in the case of a corporate raider;
- option to contract: if the company merges to form a larger organization due to certain synergies and immediately lays off many of its employees.

When there is a merger of retail and a corporate bank, the market size, both for one division and for another automatically extends. Mergers and acquisitions will have an effect similar to the growth option described earlier.

The problems can occur when the seller does not estimate its real options, it is like throwing money in the bin, or when the buyer does not estimate those strategic options, it is underestimating a potentially highly profitable acquisition target [Mun 2006].

Portfolio management

Another application of real options can be in the field of portfolio management. A portfolio is a collection of programs, projects and/or operations managed as a group. The components of a portfolio may not necessarily be interdependent or even related, but they are managed together as a group to achieve strategic objectives. Portfolio management is the centralized management of one or more portfolios, which includes identifying, prioritizing, authorizing, managing, and controlling projects, programs and other

related work to achieve specific strategic business objectives. Firms have opportunities to invest. An opportunity is an option – a right but not an obligation to take some action in the future [Dixit and Pindyck 1995]. The portfolio management process is very complex, so companies must have clear strategies for this process. Because portfolio management is strategic planning, compound real options (strategic options) can be applied here.

According to Han, Smith and Trigeorgis [2006] real options thinking has already made an impact on strategic management theory in the last two decades through its ability to view investment opportunities as corporate real options.

In my opinion, a portfolio can be seen as a project: a project to create an optimal investment. It can be done in stages, as described in Figure 4. Compound real options are options on options, all such big projects (portfolio that will be created) can be divided into small projects, where for each small project one or more simple options may be applied. The first step is planning a portfolio: a portfolio manager chooses assets/projects or programs for a portfolio. During that planning the portfolio manager must choose: how much should be invested in the projects with short-term profitability vs. projects with long-term growth potential or strategic significance? Portfolio planning approaches traditionally have two main dimensions or metrics: a short-term profitability metric and a growth potential metric. There must be a proper balance among those for the long-term success of a firm [Han, Smith and Trigeorgis 2006]. During the decision making process a portfolio manager must take into account in the future that the growth option will take place here.

In the second stage a portfolio manager must evaluate his/her portfolio. In the third stage he/she should check and compare his/her own portfolio with alternatives on the market. If he/she has alternative assets/projects and/or programs, portfolio must be recreated. In fact, checking and comparing a portfolio with market alternatives is an option to switch to (simple

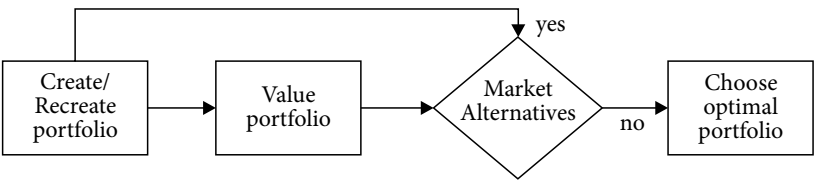

Figure 4. Decision making in portfolio management

Source: Han, Smith and Trigeorgis [2006]

real option). Also, an option to defer can be used here: a portfolio manager will wait with buying an asset/project or/and program until new information appears. By this way he/she can learn about asset/project or/and program, therefore he/she can reach a better decision.

In the last stage a manager can use an option to delay or an option to abandon when it is needed (when one or more components of a portfolio are changed for the worse). In this case a real option gives the flexibility to change assets/projects and/or programs in a portfolio to the better ones and as a result to obtain an optimal portfolio and it will be good for growth.

Conclusions

From 1977 until today real options have changed from academic theory to practical use in variable industries. To the majority of their users' real options are a way of thinking, an analytical tool and an organizational process which is beneficial for the success of a company.

There are similarities and differences between real options and financial options. Both of them give the right without obligation to obtain something of value upon the payment or giving up of something else. Therefore, financial options models and tools can be used in the case of real options (Black and Sholes model [1973], binominal tree, etc.). The difference between real and financial options is in the case of underlying assets: real options have real (physical) assets.

Real options can be used in banking and other industries, e.g. in portfolio management, as a tool for a company's capital budgeting, financial strategies, investment, and risk management. Real options can be used in both operating and financial decisions. By preserving the flexibility that real options give to both scaling up an investment, in good scenarios, and scaling down or abandoning the same investment, in down scenarios, firms may be able to turn a bad investment into a good one. Using real options can reduce risks and avoid losses, because of the flexibility that it gives.

Despite the popularity of real options, banking and portfolio management sectors do not apply them commonly. In an attempt to bridge the gap, this paper proposes different ways for the application of real options as a tool to achieve sustainable growth in banking and portfolio management. The sustainable growth in banking and portfolio management is very important since it has an impact on economic stability. Real options should be then used more widely in those sectors.

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