Risk Assessment of Equities. A BVB Case Study

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Abstract. *Dividends distributed to shareholders are an important factor in determining the price of shares and of a company's bonds on the market. The company's profits and the rate of their future growth are the basis from which the current and future dividends are set. These dividends represent the cash flows earned by investors because of the investment made by buying a company's shares. There are multitudes of analysts in the financial markets who try to predict the profits of different companies to make recommendations to their customers for selling or buying shares. It has been noted that significant changes in stock prices are generally related to the announcement of profits whose value differs from the one projected. Thus, when profits are announced higher (or lower) than expected, the market share price will increase (or decrease). These "surprise" profits may be due unexpected changes in demand for the product or production costs or the need to improve the research ability of some financial analysts. The value of financial assets is also established on the market, but the valuation process is different because the financial assets are purchased for the cash flows it generates and not for the services offered. For some financial assets, the revenue stream is easy to determine and an example is the interest on a bond. Regardless of the difficulty of measuring revenue flows, their prediction is the starting point for the value attribution of financial assets. As cash flows are generated over time and may have a degree of risk, the other component of the valuation procedure should include the expected return. Through this research paper, we aim to establish the best ways to evaluate equities, corporate bonds specifically. What we want through this work is to support companies trying to get financing either on the stock market by listing on the stock exchange or by issuing corporate bonds. Having the knowledge and information necessary for a good valuation and estimation of cash flows for as long as possible time, gives them a competitive advantage. It also provides financial stability, balance and fair financial decision-making. This paper aims to support the business environment through the suggestions we make in this research, to inspire decision makers in the area of financial management, treasurers of companies, all those who know how to estimate the future value of some values movable bonds of nature, to help them make the right decisions. The Case Studies developed in this paper are based on the theoretical models described in the body of the manuscript and underline the role and the importance of the financial prediction in the efficiency of portfolio management.*

Keywords: *Risk; bonds; coupon; liquidation value; value in use.*

Introduction

There are several different definitions of value and these definitions are appropriate in different cases. The first distinction that needs to be made is that between liquidation value and value in use. Liquidating value is the amount that can be obtained if an asset or group of assets - for example, the total of assets held by a firm - is sold separately from the organization that used it. The amount of the proceeds of the sale of each asset class represents the amount of liquidation of those assets. Once the owner's debts are deducted from this amount, the difference is the value of the business's liquidation.

A company's going concern value is its value when considered as an operating entity, with the respective management team and the strategy used. If this value is greater than the liquidation value, the difference is the value of the organization, distinct from the value of the assets it holds. Also, the difference between the book value of an asset, that is, the one recorded in the accounting documents, and the market value, i.e. the one at which the asset can be sold. If the asset in question is a firm, it actually has two possible market values - a liquidation value and a value in use. The larger of these two values is generally reflected by the stock market price. Obviously, if the liquidation value is higher than the value in operation, the firm is worth more "dead" than "living", and the market price of the shares will reflect the expected revenue to be obtained as a result of the liquidation of the company.

A bond is a long-term payment promise (maturity of one year or more) issued by a company or by a government unit. A bond is issued at a par value or face value, typically of $ 1,000, which is the amount the company promises to pay at maturity and is enlisted on the bond. The obligation also involves the issuer paying a certain amount of money as annual interest (payment can also be made half-yearly) on a regular basis until maturity. The bond coupon rate (or interest rate) is determined by dividing the amount of money that is paid annually to the face value of the bond. Thus, if a bond has a face value of $1000, and the payable interest is $120, the bond coupon rate is 12% (although bond interest payments are called coupon payments, there is no longer a system of coupons detachable from the bond as it was in the past).

Unlike a bank loan when the contract is designed by the bank (i.e. the lender), the bond is contracted by the issuer (hence the debtor). According to Bessis (2015), banks that do not differentiate risks of their customers would suffer from adverse economics. Overpricing good risks would discourage good customers. Under-pricing bad risks would attract bad customers. Discouraging the relatively good clients and attracting the relatively bad ones would result in adverse selection.

Interest rate risk is more difficult to manage than the risk arising from market variables such as equity prices, exchange rates, and commodity prices. One complication is that there are many different interest rates in any given currency (Treasury rates, interbank borrowing and lending rates, swap rates, mortgage rates, deposit rates, prime borrowing rates, and so on). Although these tend to move together, they are not perfectly correlated. Another complication is that we need more than a single number to describe the interest rate environment. We need a function describing the variation of the rate with maturity. This is known as the term structure of interest rates or the yield curve (Hull, 2015).

The binding contract may have different variations from the standard situation, as we will further demonstrate. In terms of revenue the bond brings, there are several possibilities as such fixed coupon (standard case, 90% of cases), variable coupon (indexed with the inflation rate or with the price of a commodity), participatory bonds (annual income has two components meaning fixed component and profit sharing). Another possibility could be convertible bonds. The option to convert the bond into shares is offered. It is a way to sell stock in advance. Since an option is offered, the coupon may be smaller. At the time of issue of such a bond, the price of the share must be less than the implicit price that would result from the conversion. Finally, in terms of revenue the bond brings, we have bonds with "rights". It gives the bondholder the right to buy the company's shares at a predetermined price. It differs from convertible bonds because in this case the investor does not give up bonds, does not convert them into shares.

According to Brennan and Schwartz (1977, 1980), a convertible bond can be valued only if the call strategy of the bond issuer and the conversion strategy of the investor can be determined. Naturally, it is assumed that both the issuing firm and the investor pursue an optimal strategy. This gives rise to two important lemmas. The first gives a stronger condition on the value of the bond while the second represents the firm’s optimal call strategy which minimizes the value of the convertible bond.

(1.) It will never be optimal to convert an uncalled convertible bond except immediately prior either to a dividend date or to an adverse change in the conversion terms, or at maturity.
(2.) The firm's optimal call strategy is to call the bond as soon as its value if it is not called is equal to the call price.

Together, these two lemmas give additional boundary conditions on the value of the bond and help in the pricing process. Finally, since there exists no known analytical.

With regard to repayment, the company may redeem the bonds in several ways. The redemption may be full at maturity, but it is risky given the large amounts of cash required. That is why, in our opinion, redemption must be progressive, either on the basis of the serial number of the bond (repurchase before maturity, in several years depending on the serial number), either by lottery or through the market (buying market bonds at market price - advantageous for the company when the price is below the face value).

According to the degree of sophistication of the internal rating systems, banks are allowed to choose between a basic or an advanced approach (Baltensperger, 1980). The first is called FIRB (Foundation Internal Rating Based) that allows the banks to compute only the PD estimate from their internal systems while the other factors are provided by the banking authority. The second approach is AIRB (Advanced Internal Rating Based) that allows banks to internally compute all the factors. Internal rating systems can be used to compute the minimum capital requirement only on approval by the banking authority, which is obtained after the demonstration of the ability of the internal rating classification (Anolli, et. al., 2013).

The word risk has multiple meanings. Thus, it is necessary to specify what is understood when discussing the concept of risk. For the purposes of this book, we define risk as the degree of uncertainty that exists about the return of future net cash flows generated by making a particular investment (Población, 2017).

„Risk is defined as a degree of uncertainty; therefore, when quantifying it, it should be noted that when an investment is made, the profitability of it is uncertain or equivalently a random variable and must be treated as such. In this regard, when an investment is made only the value of the moments (mean, standard deviation, etc.) associated with it can be quantified" (Javier & Garcia, 2017, p.17). Also, „risk is seen as the potential of loss resulting from the interaction with uncertainty (…) For example, exposure to foreign exchange rate is the size of revenues in foreign currency; exposure to interest rates can be measured by the size of debt indexed on market rates. The uncertainty cannot be eliminated but the exposure to uncertainty can be changed" (Bessis, 2015, p.2).

Changes to standard contracts may also occur for assets deposited as collateral. There are bonds without collateral, unsecured (debentures), which can be used for large, solvent companies that do not pose major risks, as there are bonds with fixed assets deposited as collateral (equipment, buildings, land), called mortgage bonds. The contracts also contain restrictive clauses. In the binding contract, the issuer imposes certain restrictions in order to reduce the risk of the debtor. Restrictions may refer to asset management. The company undertakes not to sell mortgaged assets, not to acquire too many assets (i.e. to limit growth), to maintain liquidity within certain limits. Regarding the shareholders, the contract restrictions refer to the level of dividends, restricts the size of the salaries and benefits of the management team, so as not to transfer a welfare transfer from creditors to shareholders and managers. With regard to the flexibility clause (option), it can be offered either to the issuer (the callable bond case) or to the obligor, if the bondholder requests an out-of-date redeemable bond or the extension of the contractual terms after maturity (expandable bond).

According to Población (2017), it must be taken into account that liquidity varies over business cycles, as in times of crisis it decreases while in times of prosperity it grows, which in many cases leads traders to believe that liquidity will be much greater than it really is, even in moments of crisis.

At the issuance moment, bonds have a market value that is set very close to face value. However, after the issue, the market value may vary greatly from the face value. Coupon payments are constant, so that when the economic conditions change, such as changing interest rates or changing the company's risk, and consequently changing the degree of risk of the bond, the market value of the bond changes as well.

A bond is the payment of a certain amount of money, as interest, over the entire maturity period and the repayment of the nominal value written on the bond at maturity. Therefore, a bond is an annuity, plus an amount that is paid at maturity (when the repayment of the borrowed amount is done). The value of the bond is therefore the current value of this line of payments. What we aim to demonstrate through this paper is the complex way in which equities papers are valued when market conditions fluctuate.

We will use quantitative research, analyzing figures and the method of statistical analysis, we will rely on the numerical measurement of certain aspects specific to the phenomena that manifest in the activity of SMEs. As Sandor states (2014, p.22), quantitative research is based on empirical, positivist or post-positivistic paradigms. While qualitative research covers a wide variety of approaches, it is not based on numerical measurements, pursuing the comprehensive description of an event or the SME as a social entity. Qualitative research is based on paradigms such as rationalist one.

In the case study we will analyze the role and the importance of the financial prediction in the efficiency of portfolio management. As research tool we use the comparison methodology of stocks, using the Multiple Growth Model (MGM) developed by Gordon and Shapiro (1956). Using the MGM model, we will emphasize the advantages of choosing one of investment scenarios, based on calculus which involves returns and risk (Alarcon et. al., 2005).

The main computational theories and models

Any investment involves a risk. Landoll (2005) said that a security risk assessment is an important element in the overall security risk management process. Other authors, considers that a particular type of investors, named "institutional investors" are considered as a common feature of modern capital market (Muhammad et. Al. 2018) Security risk management involves the process of ensuring that the risk posture of an organization is within acceptable bounds as defined by senior management (Chapman, 2011). In the following pages we will try to come up with some models to predict the evolution of equities prices, possibly with examples.

1. The Dow Jones Theory

This theory starts from these two premises: 1. The manipulation of the primary trend is not possible; 2. Market reflects all available information. Also, authors Daw Charles and William Peter Hamilton also say there are three types of prices that should be followed: Primary movement-major trend (Figure 1); these are market reactions that last from a few months to a few years and represent the strongest market trend. These moves are typical of a bullish (upward) or bearish (downward) market. Once it has been identified, it remains in the same direction until there is a major cause that changes the direction of the trend.

Figure 1. *Primary Movements – Major Trend*

Then it's the Secondary –medium trend (Figure 2); These moves last from a few weeks to a few months. It is actually a movement contrary to the primary trend and is usually reactionary to nature. It is often identified with a correction of the primary trend (positive on a bearish trend - a rally as a reaction or negative on a bullish primary trend).

Figure 2. *Secondary movements – Medium Trend*

and Tertiary – minor trends (Figure 3) or daily fluctuations - takes a few days and may be along with the primary trend or against it. These can be dangerous and irregular. One face on this subject of prediction is very difficult, and often it is subject to a shortcoming or danger (Ghid Bursier Maximal, n.d.).

Figure 3*. Tertiary Movements – Minor Trend*

2. Discounted Cash Flow (DCF)

„The discounted cash flow (DCF) formula is equal to the sum of the cash flow in each period divided by one plus the discount rate (WACC) raised to the power of the period number" („Discounted Cash Flow DCF Formula", n.d.).

The DCF formula:

***Figure 4**. The DCF formula*

Where:
CF = Cash Flow in the Period
r = the interest rate or discount rate
n = the period number

Discounted Cash Flow (DCF) is an evaluation method used to estimate the value of an investment based on its future cash flows. DCF's analysis attempts to show the value of today's company, based on estimates of how much money it will generate in the future. The DCF analysis detects the current value of estimated future cash flows using an update rate. An estimate of the current value is then used to assess a potential investment that one might make in that company. If the value calculated by DCF is higher than the current investment cost, the investment opportunity should be considered (Chen, 2019).

3. Capital Asset Pricing Model (CAPM)

The Capital Asset Pricing Model (CAPM) is the equation describing the relationship between the expected return of a certain value of a security and the systematic risk measured by its beta coefficient (Smirnov, n.d.). In addition to risk, the model takes into account the effect of risk-free interest rates and the expected return on the market. The Capital Asset Pricing Model (CAPM) describes the relationship between systematic risk and expected return on financial assets, but especially inventories. CAPM is widely used throughout the financing of risky equities pricing and the generation of expected revenues for assets (shares, bonds, etc.), given the risk of these assets and the cost of capital invested (Kenton, 2019).

$$ER_i = R_f + \beta_i(ER_m - R_f)$$

***Figure 5**. The CAPM Formula*

Where:
ERi = Expected return of investment
Rf = Risk-free rate
βi = Beta of the investment
ERm = Expected return of market
(ERm - Rf) = Market risk premium

4. Dividend Discount Model (DDM)

Dividend Discount Model (DDM) it is a way of evaluating a company based on the theory that the action is worth updating the amounts of all future dividend payments the company promises to offer. It is used to measure stocks based on the net present value of future dividends. Financial theory states that the value of a stock is the value of all future cash flows that are expected to be generated by the firm, updated with an appropriate amount adjusted to the risk that that asset assumes. We can use the dividend as a measure of cash flows returned to the shareholder or whose persons decide to invest in that asset ("Dividend Discount Model << DDM >>", n.d.).

$$Instrinsic\_value_{stock} = \sum_{t=1}^{\infty} \frac{CF_t}{(1+k)^t}$$

***Figure 6**. The DDM Formula*

Where:
CF - Dividends

5. The Multiple Growth Model

The Multiple Growth Model was developed by Gordon and Shapiro (1956). This model involves finding a moment in the future after which the dividends will increase with a constant average rate g. If we note this next moment with T, then the dividends D1, D2, ... DT will be predicted separately from the investor. Subsequently, dividends that are considered to increase with a constant rate g will be predicted as follows:
$D_{T+1} = D_T (1+g)$
$D_{T+2} = D_{T+1} (1+g) = D_T(1+g)^2$
$D_{T+3} = D_{T+2} (1+g) = D_T(1+g)^3$
.....

To find out the present value of the share, the dividends are updated differently, dividing them into two groups:
i) In the first situation, dividends received up to and including T is updated. This value is denoted by VT.

$$V_T = \sum_{t=1}^{T} \frac{D_t}{(1+k)^t}$$

ii) In the second situation, dividends distributed after the time T are updated. Also, the investor is not considered to be at t = 0, but at t = T(1). At this point (t = T) dividends are updated according to the constant growth model, and this value will be updated at time t = 0(2).

$$V_T = D_{T+1}\left(\frac{1}{k-g}\right)$$

$$V_{T+1} = V_T\left[\frac{1}{(1+k)^T}\right] = \frac{D_{T+1}}{(k-g)(1+k)^T}$$

With the two V_T and V_{T+1} values, the updated action value will be:

$$V = V_T + V_{T+1} = \sum_{t=1}^{T} \frac{D_T}{(1+k)} + \frac{D_{T+1}}{(k-g)(1+k)^T}$$

To determine the rate of return required by shareholders, the following formula is used:

$$V_T = \sum_{t=1}^{T} \frac{D_t}{(1+k^*)} + \frac{D_{T+1}}{(k^*-g)(1+k^*)^T},$$

where,
V_T - stock exchange rate of the stock;
k * - the rate of return required by shareholders.

From this formula, the rate of return required by shareholders could be mathematically derived.

Case studies on financial companies listed on the Bucharest Stock Exchange (BVB)

The aim of the case study is to emphasize the most efficient scenario of investment in stocks in a market with a relative high volatility, using a comparative methodology. Practically it is important to test the assumption that the acquisition of a single stock (best traded on the Bucharest Stock Exchange) is more efficient or not than the acquisition of a portfolio of very good stocks. Also, we want to verify the assumption that the investment in bank stock is superior that other stocks of financial investment funds (traded also on the BVB).

The data was collected from BVB. The selected companies in our portfolio are listed at BVB and the values of the stocks are the average values of the daily stock's values. We have used the MGM model described above to compute the return rate and risk of each stock and for the portfolio.

For the first step, we want to calculate the estimate value in time for a relevant bank stock. Thus, we will pick Transylvania Bank, one of the most traded company at BVB in the previous year. According to BVB, the dividend in 2018 was D_0 = 0.17 lei. Our goal is to estimate the price value of the stock.

In order to estimate the future value of this stock, we will use an extension of the DMM, namely The Multiple-Growth Model (MGM), which was introduced in the previous chapter.

We will assume that for the first 5 years the dividend will be constant, and after that period the dividend will increase with a constant rate g. For g we will take the inflation from 2018, which, according to the National Bank of Romania, was set to g = 4.6%.

According to the MGM model, the price of the dividend, with a return rate of k*=10%, would be:

$$V_T = \sum_{t=1}^{5} \frac{0.17}{(1+.1)^t} + \sum_{t=6}^{\infty} \frac{0.17(1+0.046)^{t-5}}{(1+.1)^t}$$

$$P = (0.17)\sum_{t=1}^{5} \frac{1}{(1+.1)^t} + \frac{0.17}{(1.1)^5} \cdot \sum_{t=6}^{\infty} \frac{(1+0.046)^{t-5}}{(1+.1)^{t-5}}$$

$$P = (0.17)\sum_{t=1}^{5} \frac{1}{(1.1)^t} + \frac{0.17}{1.1^5} \cdot \sum_{t=6}^{\infty} (0.95)^{t-5}$$

The two sums are geometric series, which will be evaluated by using the formulas:

$$1 + a + a^2 + \ldots + a^T = \frac{1-a^{T+1}}{1-a}$$

$$a^T + a^{T+1} + \ldots + a^n + \ldots = a^T \left(\frac{1}{1-a} \right)$$

Hence, the above equation becomes:

$$P = (0.17)\sum_{t=1}^{5} (0.91)^t + \frac{0.17}{1.1^5} \cdot (0.95) \sum_{t=6}^{\infty} (0.95)^{t-6}$$

$$P = (0.17)\frac{1-(0.91)^6}{1-0.91} + (0.10)\frac{1-(0.95)^5}{1-0.95}$$

$$P = 2.81$$

So, we conclude that the estimated value of the stock is 2.81 lei.

The second step is to test the assumption that the acquisition of a single stock (best traded on the BVB) is more efficient or not than the acquisition of a portfolio of very good stocks. In order to test this assumption, we will take a portfolio with 3 stocks, which were ones of the highly traded on BVB last year: Transylvania Bank (TVL), BRD Groupe Societe Generale (BRD) and SIF Oltenia (SIF5), according to Wall Street Journal. We will make a portfolio with these 3 assets, with equally spited weights (33.33% each) and for this portfolio we will compute the return and risk.
The period of time is from 1st of June 2018 to 31st of May 2019, daily data. We will start with finding the average return, risk and correlation coefficients between these 3 stocks and the results are in the following table. For risk we have used the standard deviation value as a proxy.

Table 1. *Correlation coefficients between the analyzed assets*

	TLV	BRD	SIF 5
TVL	1	0.85	-0.12
BRD		1	-0.22
SIF 5			1

Table 2. *Return and risks of the analyzed assets*

	TLV	BRD	SIF 5
Return	0.2%	0.3%	0.1%
Risk	0.22%	0.14%	0.07%

Regarding the data presented in the table, we can confirm the first assumption that the investment in Bank stock (BRD and TLV) is superior in terms of return, that other stocks of financial investment funds (SIF5).

The next step is to find the return. For this we will use the formula:

$$E(R_p) = w_1E(R_1) + w_2E(R_2) + w_3E(R_3),$$

where,

w_i - are the weights

$E(R_i)$ - expected return of the stock i

$E(R_p)$ - expected return of the portfolio

Now we plug in the values and get:

$$E(R_p) = .33(0.2) + .33(0.3) + .33(0.1)$$

$$E(R_p) = 0.2\%$$

So, we conclude that, during the analyzed period of time, the portfolio had a 0.2% return.

Further, we will find the risk using the formula:

$$\sigma_p = W \cdot \Omega \cdot W^T$$

where

W- weights matrix

Ω - variance – covariance matrix

$$\Omega = \begin{pmatrix} \sigma_{11} & \sigma_{12} & \sigma_{13} \\ \sigma_{21} & \sigma_{22} & \sigma_{23} \\ \sigma_{31} & \sigma_{32} & \sigma_{33} \end{pmatrix}$$

and $\sigma_{ij} = \sigma_i \cdot \sigma_j \cdot \rho_{ij}$

Now we plug in the values and get:

$$\sigma_p = (0.33, 0.33, 0.33) \cdot \begin{pmatrix} 0.0484 & 0.026 & -0.0018 \\ 0.026 & 0.0196 & -0.0021 \\ -0.0018 & -0.0021 & 0.0049 \end{pmatrix} \cdot (0.33, 0.33, 0.33)^T$$

Using Wolfram Alpha software, we will get:

$$\sigma_p = 0.01275$$

In conclusion, the risk of the portfolio is 1.27% and the return 0.2%.

Conclusions

Analyzing the literature review presented in the theoretical part and the data involved in the case study, we can conclude about the following aspects.

First, we can conclude that there are computational models like the MGM model (previously presented in the paper) which can predict with a reasonable accuracy the estimated value in time of a stock.

Secondly, we can appreciate that it is possible (also feasible) to compare the different scenarios of acquisition of one single set of stocks (best stocks traded on the market) or a portfolio of stock (with a mixture of very good stocks). Taking into account about the value of expected value of stock and expected value of portfolio, but also for the value of risk, we can conclude about the most favorable investment scenario.

Third, we can conclude that, in the previous year, there was a high volatility on the BVB, especially due to some turbulence on the banking system. The portfolio analysis revealed the fact that investing in the most traded assets from BVB would give a positive return for the investors.

Among the three stocks we have analyzed, the minimum value for risk/return ratio was for SIF5, while the maximum was for TVL. That means, during the analyzed period SIF5 was more stable than the Transilvania Bank. This result is in line with the work of Rogoz (2018) who argued that the previous year was a good year to invest in Investments Funds rather than investing in Banking Sector.

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