DEVELOPMENT OF A FINANCIAL MODEL IN A BUSINESS: THE CASE OF A COMPANY IN PLASTICS INDUSTRY

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Abstract

The purpose of this study is to analyze and explore thoroughly the economic situation of one of the leading European producers of masterbatches and agricultural films, hereafter (PK SA) and to propose various ways of development and expansion. In this paper, the operational analysis tools (PEST, SWOT and Porter) were used to analyze the company's external and internal environment. Next, a financial analysis based on the financial data of PK SA was carried out. Moreover, a financial model for the years 2012-2016 has been constructed in Excel so that by using possible future scenarios to forecast the financial future of the company for the next five years 2017-2021. The conclusions show that the company has a great potential to increase sales and profits, exploiting its potential and, above all, its extroversion, can achieve further growth over the next five years.

Keywords: PEST, SWOT, Porter, Financial analysis, WACC

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1. Introduction

The aim of this study is to explore and present important and accurate steps in how to conduct a strategic analysis of the internal/external environment and how for the scenarios revealed to model and examine the proposed solutions. The company PK S.A., along with its subsidiaries in France, Romania, Poland, Russia, Turkey and China, is mainly active in the production of plastic products used in agriculture, engineering, water management, protection of the environment and raw materials in the wider plastic industry. It is one of the largest Greek manufacturers of high-tech and high-quality plastics, and is one of the largest and most important European producers of masterbatches and agricultural films. This gives it an international orientation with exports to more than 50 countries around the world.

The strategic analysis tools PEST and the Porter's five forces model - competitive analysis are used to define the external environment, the SWOT analyses both the internal and external environment.

PEST analysis attempts to identify which of the external factors of the company's macro-environment has significantly affected itself and its competitors in the past and the imminent changes that these factors will make in the future making them more or less important (Theriou, 2014). The PEST analysis covers a wide operational area and reflects aspects of the company's current state of affairs (Gouskos, 2005). SWOT analysis is a simple framework for generating strategic alternatives from analyzing the current situation. Applied either at company level or at company unit level, and often occurs in marketing plans (NetMBA, 2010). From company's strategic planning point of view, SWOT analysis is a tool for analyzing the interior in combination with that of the outside environment. The company can have the right information to make the right decisions that will lead to the achievement of its goals (Chatzikonstantinou and Goniadis, 2009). The Porter's five forces examine the external factors that directly affect the future of the company, these factors relate to its competitive environment, i.e., whether the company can cope successfully and successfully operate among its competitors and survive. Competitive environment factors directly affect the course and strategies of the business (Theriou, 2014).

We will develop prognosis in the form of scenarios that are usually based on historical data, but may also be due to changes that

have been made to the business plan, even changes that affect the entire branch in which the company operates and the global economy.

Three important concepts that are distinctive and necessary for the creation of the financial model. First the Weighted Average Cost of Capital (WACC), second the Capital Asset Pricing Model (CAPM), third the valuation method Net Present Value (NPV).

To create the financial model, we use the spreadsheet program Microsoft Excel. Spreadsheet programs are widely used to manipulate and analyse advanced and complex numerical data. By entering the data into a spreadsheet, a large variety of mathematical and economical calculations can be performed even if complicate structures are involved (Chan et al., 2000). Spreadsheet modelling is recognized as the most frequently used application in the modern companies for their business decisions (Kruck, 2006).

The paper continues as follow: section 2 refers to theories on how to develop strategy and how to bring all data under modeling frame (using Excel and visual basic), section 3 deals with the presentation of the financial modeling scenarios, section 4 analyzes the methodology that is used to develop the Excel model, section 5 analysis and presents the results and section 6 concludes the paper and refers the future propositions.

2. Strategic Analysis

2.1. PEST Analysis

Company's external environment macroeconomic factors are presented and analyzed using PEST analysis as follow:

2.1.1 Political factors

Political stability is one of the most important political factors. The deep crisis is the result of the vicious circle that arose from the massive public debt and the problem created by the banking system. Government regulations and legal regulations have implications for businesses. The level of tax rates and extraordinary contributions have a significant impact on the financial performance of the agencies.

2.1.2 Economic factors

The financial situation of the Greeks influences their purchasing power and, to an extend companies themselves. The country's banking system, through its own crisis characterized by the lack of liquidity, is affecting the course of the economy. The low trade volume today on

the Athens Stock Exchange do not allow companies to acquire new funds that would allow them to make new investments and expand their businesses. Ecology, although it is primarily a social factor, has significant economic implications because the choice of plastic products versus those considered more environmentally friendly affect the financial figures of the companies.

2.1.3 Social factors

One of the most recognized social effect is the population change that has occurred due to the immigration problem. It has added cheap labor to areas where there was a deficit, such as agriculture, but it has also worsened the already inflated unemployment problem.

Ecological concerns are a cause for a new view of consumer behavior. Many types of plastic tend to be replaced by other materials, such as paper and wood. International organizations CODEX and ISO issued certifications mainly for food-grade plastics. The European Union has adopted strict regulations for the implementation of the HACCP system (Moullas and Georgiadou, 2017). Many of the materials used in agriculture, such as greenhouse leaves and pipes, are more ecological options since alternatives such as copper pipes need more energy to produce them.

The innovative solutions offered by PK S.A., mainly in the agricultural sector, have a significant impact on the standard of living of farmers by reducing working times, improve product output, and ultimately increase profit.

2.1.4 Technological factors

A cornerstone of technology is research and development of innovations. The export orientation of the company is based on the benefits of innovations. PK S.A. is constantly launching new and innovative products ensuring sustainability and increasing competitivity. Ensuring each patent with the corresponding credentials, allows the company to penetrate the markets and consolidate its positions.

2.2. SWOT Analysis

The PK S.A. as every company has strong and weak points concerning the internal environment, and opportunities and threats that arise from its external environment. Bellow some points:

Table 1

PK S.A. SWOT Analysis

Strengths	Weaknesses
• Innovations - Patents - corresponding credentials. • Effective research and development specialization. • Continuous investments in modern facilities. • A wide variety of products. • Flexibility - Collaborations. • The company's trademark. • Human resources. • Inventories with a special logistics program.	• Unstable political status. • Influence of the international oil prices. • Prices of raw materials. • High transport costs. • Growing penetration of products from low-cost countries. • Significant capital requirements for developing international actions. • Currency risk.
Opportunities	**Threats**
• Upward trend of the branch. • Extroversion. • New technologies (new materials, processes) - Research. • Expanding to low cost countries. • Green Activities - Recycling. • Absorption - Buyout of small businesses. • Strategic alliances inside and outside Greece.	• International oil prices. • Strong price competition in the domestic market. • High loaning. • Concentration of market shares to a few large companies. • Unpredictable political decisions (new financial arrangements, taxes). • Recession - Tax system. • New substitute products from low cost countries.

Source: (KEMEL, 2017)

2.3. Porter's Five Forces model - competitive analysis

2.3.1 Threat of new Competitors Entry

Chemical industries have grown in Greece since 1950s and have grown considerably. According to Greek statistical authorities, 241 companies operate in Greek territory. Earnings before interest, taxes, depreciation and amortization (EBITDA) amounted in 2014 to 7.3%, from 6.6% in 2013 (inr.gr, 2016).

It is obvious that the presence of new competitors in the branch is unlikely due to the already existing competition. Even the huge costs of creating a new plastic production unit with the existing expanded commercial network is another reason to discourage new units to enter, especially after the start of the financial crisis in 2009.

2.3.2 Threat from Substitute Products

In all branches new products come to replace the existing ones for varying reasons. Substitute products can't replace many specialized products in the branch. By targeting specific agricultural and non-agricultural products, the company managed to eliminate the risk of substitutes. Some of these products are:

- The masterbatches produced by the company worldwide.
- The sheets with more than seven layers to cover greenhouses whose price and practicality can't be reached so far by glass.
- Geomembranes for soil cover either for waterproofing or for the prevention of parasitic plants (reduction of pesticides).

In conclusion, it seems that the company is not threatened in most of its products by substitutes.

2.3.3 Bargaining Power of Suppliers

Suppliers of raw materials for plastic companies have a strong bargaining power. Among their most basic raw materials are polyethylene (PE), polypropylene (PP) and polystyrenes (PS), all of which are derivatives of petroleum and are mainly imported from other countries. PK S.A., as one of the largest companies in the branch, has the advantage of making direct imports from the chemical industries in large quantities, achieving better prices.

2.3.4 Bargaining Power of Buyers

PK S.A. has an impressive record in research and development, with its innovative products, especially the "masterbatches", makes its negotiating power over buyers remarkable. Of course, despite all the innovative activity, it does not diminish the big competition either from industries in the branch or from importers and traders.

2.3.5 Rivalry among Existing Competitors

The intense competition in the plastics market, with the exception of the pipe sector, primarily forces the largest manufacturing companies to invest in the modernization and renewal of their machinery equipment to achieve greater automation of their production

process. Also, to extend their distribution network through their representatives.

3. Financial Modeling Scenarios

In order to be able to come up with safe and documented conclusions, that can be safely used by the company, we will develop forecasts in the form of scenarios. These scenarios are based on the previously mentioned analyses and on a number of factors, such as historical data, possible changes in the business plan, the branch or the global economy. When we draw up a scenario, we must plan it from the beginning so that the results that come up with it are correct and reliable. The created scenarios / forecasts will be detailed below.

3.1. Scenario 1 - Stability

In the first scenario, we use the averages of the historical data from the past five years (2012-2016) analyzed using Excel. The first scenario is the realistic one. The value for market return (Rm) is the result from the sum of the returns on the market index, so we have Rm = -4.57%. For the risk free we use the 12 months treasury bills, i.e. Rf = 4.85%.

Table 2

First scenario parameters

1st - Scenario	
Increase sales rate	5,66%
Current assets / Sales	66,94%
Short-term liabilities / Sales	14,39%
Net assets / Sales	107,33%
Cost of sales / Sales	78,34%
Interest rate on borrowing	2,92%
Tax rate	29,00%
Return to Market (Rm)	-4,57%
Risk Free (Rf)	4,85%

Source: Own development through data processing

3.2. Scenario 2 - Optimistic

An optimistic scenario that is not far from a possible development is the further increase in sales. This is justified by the company's key feature of investing in innovation and making key partnerships.

Table 3

Second scenario parameters

2nd - Scenario	
Increase sales rate	9,50%
Current assets / Sales	55,00%
Short-term liabilities / Sales	10,00%
Net assets / Sales	88,00%
Cost of sales / Sales	63,00%
Interest rate on borrowing	4,00%
Tax rate	29,00%
Return to Market (Rm)	9,20%
Risk Free (Rf)	2,70%

Source: Own development through data processing

3.3. Scenario 3 - Crisis

The recent financial crisis has affected all branches. Political instability raises fears of a further deterioration in the economic situation. This will cause greater inconvenience to the financial figures of all companies.

Table 4

Third scenario parameters

3rd- Scenario	
Increase sales rate	4,50%
Current assets / Sales	70,00%
Short-term liabilities / Sales	24,00%
Net assets / Sales	126,00%
Cost of sales / Sales	92,00%
Interest rate on borrowing	7,00%
Tax rate	32,00%
Return to Market (Rm)	9,20%
Risk Free (Rf)	2,70%

Source: Own development through data processing

3.4. Scenario 4 - Stable economic environment

An equally optimistic scenario is to improve the economic figures, an economic stability that will be the result of political stability. A safe environment can encourage investments, entrepreneurship and alongside the recovery of the banks giving loans.

Table 5

Fourth scenario parameters

4th - Scenario	
Increase sales rate	8,50%
Current assets / Sales	60,00%
Short-term liabilities / Sales	16,00%
Net assets / Sales	97,00%
Cost of sales / Sales	72,00%
Interest rate on borrowing	3,00%
Tax rate	25,00%
Return to Market (Rm)	9,20%
Risk Free (Rf)	2,70%

Source: Own development through data processing

4. Methodology

We proceed with the description and analysis of the Financial Model, the value of the cash flows for the model, the calculation of the Weighted Average Cost of Capital and the Net Present Value that will lead us to the final valuation of the company.

4.1. Financial Model Analysis

According to Benninga (2001), the usefulness of forecasting, that is, the projection in the future of financial statements in the financial management of a company, is undeniable. The basis in many financial analyzes for financing a company is to create a model consisting of a set of multiple variables. Based on this model, simulations can be made for specific intervals for a possible risk assessment of negative scenarios (Mendes and Leal, 2005). Financial models are used in a variety of business applications, from financial reporting to the capital budget for the valuation and structure of mergers and acquisitions (DePamphilis, 2017).

The Key Steps for Creating the Financial Model:

1. Select the Excel program.
2. Use the techniques of Excel to link spreadsheets and alternate scenarios.
3. Enter historical data.
4. Calculation of balance sheet elements.

5. Recovering the company's share price for the calculation of (beta).
6. Asset valuation using the CAPM method.
7. Calculation of weighted average cost of capital (WACC).
8. Finding Future Free Cash Flows (FCF).
9. Discount cash flow (DCF) using (WACC).
10. Calculation of residual value.
11. Valuation using the Net Present Value (NPV) method.

For the analysis of the financial model, the Excel program used the data obtained from the financial statements (the Balance Sheet and the Income Statement) of the company's annual financial reports for a five-year period 2012-2016. These data were the basis of the historical data, the averages for the five-year period as well as the percentage change were calculated. Provisions were made for the years 2017-2021 separately for the two financial statements and the relevant spreadsheets were created in Excel, immediately after the forecasts, FCF (Free Cash Flows) were calculated. Subsequently, Discounted Cash Flows (DCF) were calculated using the Weighted Average Cost of Capital (WACC). In order to arrive at a valuation of the investment we used the Net Present Value (NPV) method.

4.2 Free Cash Flow (FCF)

For the period we want to predict (2017-2021) we used the following data to calculate the Net Cash Flow:

- Profit after tax.
- Depreciation.
- Increase / decrease of current assets.
- Increase / decrease of short-term liabilities.
- Increase / decrease of fixed assets costs.
- Debit and credit interest.

These figures arise from the corresponding financial statements of the company that we predicted for the specific period. The formula to calculate them is given below (Maditinos, 2014).

Profit after tax

+ Depreciation

- Increase in current assets

+ Increase in short-term liabilities

- Increase in fixed costs

+ Debit interest (after tax)

- Credit interest (cash & securities)

= Net Cash Flows (FCF)

4.3 Valuation method - Net Present Value (NPV)

Net Present Value (NPV) due to its unique benefits is one of the most popular valuation methods, the calculation formula is given below:

$$NPV = CF_0 + \sum_{t=1}^{N} \frac{CF_t}{(1+r)^t} \quad (1)$$

where

CF_0: is the initial investment it refers to time 0 and is negative.

CF_t: is the cash flow at time t.

r: is the cost of capital or the discount rate.

N: is the sum of the forecast years.

The NPV takes into account all the cash generated by the company in an investment plan, also satisfies the principle of added value. Another characteristic that makes the NPV an important criterion for the investment decisions of the company is its direct link with the wealth of the shareholders (Xanthakis and Alexakis, 2006).

4.4 Weighted Average Cost of Capital (WACC) - Calculation

The company's capital cost is the expected return that debt securities and its remaining portfolio can deliver. As mentioned above, we use it to discount the cash flows of a company's investment. This applies to investment at the same risk, which of course differs more than that of the total cost of the company, so the most sensible is to calculate the occasional cost separately for each investment venture (Brealey and Myers, 2003).

WACC is calculated using the following formula:

$$WACC = \frac{Equity}{Equity + Debt} * r^E + \left[\frac{Debt}{Equity + Debt} * r^D * (1 - tax\ rate)\right] \quad (2)$$

where

r^E= cost of equity.

r^D= cost of debt.

For the calculation of the cost of equity r^E we use the widely accepted Capital Asset Pricing Model (CAPM) method. We use it to measure risk-bearing securities, that is, determine the relationship of the particular risk with the expected return on the security. The formula with which we calculate r^E is given below:

$$r^E = Rf + [\beta * (Rm - Rf)] \quad (3)$$

Where *Rf* (Risk free) determines the return of risk-free bonds, (*Rm* - *Rf*) determines the risk premium of the portfolio, the beta factor (*β*) of the formula is the risk of that securities/ portfolio and *Rm* the expected market return.

For the calculation of the company's beta (*β*) we used the daily returns of both the company's stock price and the general index, which were calculated using the function Ln (today's price / yesterday) (Maditinos, 2014).

The following Excel functions were then applied to create a regression:

1. With the COVAR and VARP functions
   (beta = COVAR (Stock Market Index; Share) / VARP (Stock Market Index))
2. With the SLOPE function
   (beta = SLOPE (Share; Stock Market Index))

The market return (Rm) was calculated using the SUM function, i.e. the sum of the daily returns in the Stock Market Index to 5 years (2012-2016). As a result of the economic crisis, the general recession and the instability that exists in Greece, the *Rm* resulting from the Stock Market Index is negative, something that, as stressed in the international literature, is not acceptable for use in modeling calculations. That is the reason why in the scenarios above only in the first one, based on historical data, we used the negative value in the other scenarios we use an Rm value of 9.20%, considering that the course of the market is smooth.

For the risk-free (Rf) investments we used the return on treasury bills issued in 2016, for 12 months "4.85%" while the quarterly is "2.70%" (Bank of Greece, 2017).

4.5 Valuation

To complete valuation, we calculate the value of the investment at the end of the period i.e. the residual value of the company. After calculating it, we add it to the cash flow of the last year. For calculating the residual value, we use the Gordon Model formula:

$$Residual\ value = \frac{FCF_5 * (1 + growth)}{WACC - growth} \quad (4)$$

where

growth: increase of sales.

FCF_5: cash flows in the fifth year.

We see in the model that the residual value is negative, which is not acceptable, in order to circumvent it, we make the assumption that the company is stopping to develop further from the point where the model stops.

The formula becomes:

$$Residual\ value = \frac{FCF_5}{WACC} \quad (5)$$

Finally, after we have discounted all the cash flows that have resulted from the appropriate model calculations, we can proceed the valuation by calculating the net present value. We use two ways to calculate it, in the first we sum up all the discounted cash flows with the help of the SUM function, in the second we use another Excel function NPV, which discounts and automatically sums up the cash flows (Maditinos, 2014).

5. Results

Now we present and analyze the results we obtained with the help of the Financial Model created by Excel using the alternative scenarios described in the previous chapter, i.e. stability, optimistic scenario, crisis and stable economic environment. The comparisons are based on the first scenario of "stability", the reason is that they are the company's historical data. The scenarios valuation results can be accepted only if the net present value (NPV) is positive otherwise we classify the investigation as a failure and cannot be accepted.

5.1 Scenario 1 - Stability

Table 6

First scenario results

Free Cash Flows (FCF)				
2017	**2018**	**2019**	**2020**	**2021**
6.191.490 €	6.511.535 €	6.849.018 €	7.204.910 €	7.580.238 €
NPV (with residual Value)		170.703.825 €		
NPV (without residual Value)		30.138.074 €		
WACC		4,36%		

Source: Own development through data processing

For this realistic scenario, we used the company's averages of the last five years historical data (2012-2016). We observe that results in an economic uncertainty and capital controls are optimistic and confirm the recovery of the branch in our country. The net cash flows are positive with increasing trend, and positive is also the valuation with the NPV. The WACC of the company is reasonable, from the annual financial reports of previous years the corresponding WACC of 2011 = 5.28%, 2012 = 5.02% and 2013 = 4.90%.

Table 7

Liquidity ratios

General Liquidity Ratio							
2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
4,07	2,71	2,56	4,28	4,48	4,21	7,05	4,15
Special Liquidity Ratio							
2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
3,21	2,03	1,82	3,13	3,18	3,00	5,03	3,02

Source: Own development through data processing

5.2 Scenario 2 - Optimistic

Table 8

Second scenario results

Free Cash Flows (FCF)				
2017	**2018**	**2019**	**2020**	**2021**
17.580.136 €	19.247.918 €	21.074.087 €	23.073.689 €	25.263.198 €
NPV (with residual Value)		789.624.246 €		
NPV (without residual Value)		96.424.869 €		
WACC		3,12%		

Source: Own development through data processing

In the optimistic scenario, the increase in sales is due to the further modernization of the production units and the expansion of the customer base. At the same time, we have a minimal increase in the borrowing rate. We see an increase of the cash flows almost 2.5 times. The excess of the NPV is due to the estimated residual value of the company. We also observe a reduction of the WACC by about one percentage point despite the increase in the borrowing rate, this is due to the almost non-existent dept of the company.

5.3 Scenario 3 - Crisis

Table 9

Third scenario results

Free Cash Flows (FCF)				
2017	**2018**	**2019**	**2020**	**2021**
-5.436.622 €	-5.752.343 €	-6.055.016 €	-6.372.290 €	-6.704.846 €
NPV (with residual Value)		-211.915.969 €		
NPV (without residual Value)		-27.615.224 €		
WACC		3,12%		

Source: Own development through data processing

In this scenario we describe the continuation of the economic crisis and the unexpected performance of extroversion. The key changes that affect the model are the decrease in sales, the increase in the tax rate as well as the borrowing rate. The results that arise in this economic environment of the national crisis give us negative cash flows which inevitably leads to a negative NPV. We also notice that WACC improvement by one percentage point remains, this is always due to the almost non-existent dept of the company.

5.4 Scenario 4 - Stable economic environment

Table 10

Forth scenario results

Free Cash Flows (FCF)				
2017	**2018**	**2019**	**2020**	**2021**
10.681.587 €	11.577.350 €	12.548.980 €	13.602.920 €	14.746.160 €
NPV (with residual Value)		461.016.108 €		
NPV (without residual Value)		57.346.797 €		
WACC		3,13%		

Source: Own development through data processing

In the fourth scenario where there is a utopian improvement in the economic environment, it automatically leads to steadily rising sales, a favorable borrowing rate, and a reduction in the tax rate. As normal, cash flows maintain a steadily rising trend. The NPV, respectively, has a fairly significant increase, much of which is due to the residual value of the company. It is remarkable that the WACC in all three scenarios except the first remains the same.

6. Conclusion

The results show that the main problem is the lack of political stability in the country. The economic environment refers to tax regulations, the limited liquidity of the banking system and the reduction in purchasing power. The social consequences are the unemployment and the migration problem. The technological environment refers to research and development to launch innovative products and the company's information system.

With the SWOT analysis we identify the company's strengths, which are the specialization in innovative products and patents, human resources, flexible partnerships and efficient inventory management. The weak points are the raw material prices and the penetration of products from low-cost countries. As opportunities we see the extroversion and green activities. The considered threats are the intense domestic market competitions.

According to the five forces Porter's model, it is unlikely that new competitors will emerge, especially after the 2009 financial crisis. About the substitute products, the company is not threatened due to its specialized agricultural and non-agricultural products. Its advantage against the supplier's negotiating power factor is to achieve better prices by directly importing large quantities from the chemical industries. The factor of buyer negotiating power is weakened from the many innovative and pioneering products. The competitive environment factor is characterized by intense competition, over-supplying with an exception, the pipe productions.

For the first realistic scenario the net cash flows are positive with increasing trend, and positive is also the valuation with the NPV. The WACC of the company is reasonable. In the "optimistic" scenario we see an increase of the cash flows almost 2.5 times. We also observe a reduction of the WACC by about one percentage this is due to the almost non-existent dept. The results that arise from the "crisis"

scenario give us negative cash flows which inevitably leads to a negative NPV. We also notice that WACC improvement by one percentage remains due to the same reason. In the fourth scenario cash flows maintain a rising trend. The NPV has a fairly significant increase, much of which is due to the residual value. It is remarkable that the WACC in all scenarios remains at the same level.

The limitations of the study are: firstly, it just explores the mother company not the whole group and secondly the luck to obtain more and not widely published financial data directly from the company. This would have made the study more accurate; we therefore propose the company to continue to outsource and create specialized products as well as trying to reduce production costs to improve its competitiveness. As for future study we recommend the use of more strategic analysis tools and develop more scenarios.

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