University doctoral (Ph.D) dissertation thesis

EXAMINATION OF THE TRADING HOUSE FINANCING STRUCTURE

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1. RESEARCH BACKGROUND AND OBJECTIVES; INTRODUCTION OF THE RESEARCH HYPOTHESIS

Whether thinking about financing the input/output stocks of agricultural production or processing industry, or thinking about the trading of agricultural products or ensuring an appropriate level of liquidity on behalf of the operators, one can state that commodity finance is an absolutely necessary factor of financing agriculture. Over the years, the market of commodity financing have been growing, and the operators became more familiar with it. Its size has reached 250-300 billion forints a year, of which agricultural products-based financing enjoys the greatest share — through the different operators of market in cereals.

Continuous changing of the policy for lending in tune with the market needs, and concentration on the supplier market and the wholesale market, requires more effective and more professional financial management activity from agricultural undertakings, as well as high-quality financial and economic intelligence, and using of new financing instruments and structures, taking into consideration the characteristics of the different undertakings. Success of the specific and structured company financing system, which appeared as an alternative of the well-known financing type based on balance sheets, encourages business sector and the different fields of banking sector to get familiar with this alternative type of financing, integrating its structure into their systems.

Nowadays, commodity finance has become a widespread form of financing, as opposed to the relatively new activity of structured trade financing. Financial professionals, businesses of agricultural products and operators of the market have been learning even today its working and opportunities while in operation. Obviously, one of the reasons is novelty of the topic.

In my dissertation I have set three objectives. *On the one hand*, my objective is to provide the theoretical background of the topic of my research, with extensive using of the Hungarian and international literature. My aim is to give an overview about the different forms of agricultural financing, with special attention to the practice of commodity-based current assets financing, its guarantees and risks.

The second objective of this dissertation is to show a trade financing construction for commodity markets that provides producers, traders and/or users (feed-mills, mills) with the opportunity of freeing the capital tied up in their stocks, managing risks in a controlled way, creating favourable conditions for funders and borrowers. The advantages and usefulness of the structure will be examined through the analysis of economic, legal and financial background. A thorough picture will be given about the expected financial risks and the possibilities of risk management, making comparison with other forms of current assets-financing.

The third objective of this dissertation is to develop a financial model that can be applied to business planning and domestic practice of commodity financing. Using this model, the level of collateralization (coverage ratio) of commodity finance can be estimated and, as a result, evaluated, during the entire repayment period. Conducting a sensitivity analysis and briefing market activities of the recent years, I am intending to demonstrate the different scenarios of the model. Taking into consideration the results gained by the simulation of the model, an impact assessment is carried out, which later can give the basis of rational business decisions made by market operators.

At this point of the research, in parallel with the main objectives of this dissertation, I have made four research hypothesis:

- **H1: Developing an adequate structure of securities, the expected level of coverage can be guaranteed with commodity finance transactions, during the entire repayment period.**
- **H2: The following elements are related to each other: the coverage rate of funding, the basic prices of funding, the repayment period and the extent of security deposit.**
- **H3: In case of different products, differences can be detected in connection with measure and direction of the factors affecting the coverage ratio.**
- **H4: Due to finance costs incurred and the price volatility risk of commodity markets, the length of repayment period can make remarkable differences as regards the coverage of financing.**

2. DATABASE AND APPLIED METHODS

With respect to the objectives listed at the beginning of my dissertation, I have conducted an interdisciplinary, fact finding investigation, with the aim of demonstrating the financing process and the practical applicability of trading house financing structure (as a finance type guaranteeing foreign sources). In the followings, I demonstrate the methodology of the research, as regards the chapters in subsequent order.

2.1. Financing function of trading house

During the last ten years, I played an active role in organizing and executing of commodity and trade financing activities of some commercial banks, as well as setting up relevant legislation and business operation. Using my previous experience, in my research I examine the market environment, the operators, the guarantees and the legal situation of trading house financing, the guarantee scheme of financing, the role of this construction and the risks of the activity. The research topic is involved not only from the side of the refunders, but a more thorough analisys has been undertaken, which involves all operators of the given market fields, as implied by the complexity of the topic. As part of the analysis, I have organized relevant contexts of the topic, evaluating the usefulness of this form of financing. In my thesis, there can be found a detailed examination of combined techniques deriving from the structure, there is a demonstration of the so called 'best practice' procedures, with special attention to minimizing finance risks and maintaining the closed and controlled characteristics of the construction, as much as possible.

As a starting point, I define the topic of trade finance, the form of structured finance, then, focusing on commodity finance, I get to the point of the construction of trading house financing. After recording theoretical basis of the structure, the dissertation focuses on practical applicability of the construction. I put forward the impact made by the finance scheme on businesses and their management, I define the position of this line-of-business within the banking system, showing its advantages, disadvantages and context.

Examining relevant finance risks, I mark the existing interfaces of different kinds of risks, and I also make proposals on the possibilities of managing and minimizing them.

Focusing on the issues of busisness and risk management, I make a comparative analysis of different forms of commodity finance, based on more criteria. Besides the traditional, inventory secured current assets finance, the comparison focuses on current assets loans secured with public warehouse bonds and another form of financing which operates with the assistance of a trading house. During the analysis, I aim to follow the most relevant and frequent issues made by the operators of the structure, in special caseses underlining the advantages of some criteria compared to the others.

2.2. The calculation model of trading house financing structure

Assuming a basic structure, I have established a financial model, which is essential to demonstrate the practical and theoretical background of the area of research. Having regard to the fact that a base model was established, there is an opportunity for unlimited extention, applying additional module elements and development based on different aspects, taking into account requirements of the specific structures.
The model plays a key role during the process of financing, following the paying out process, during monitoring and accounting period, of which it can be the main instrument. Representing and monitoring the whole financing process, it gives information for all operators of the structure.

By using this model, changing in coverage position of the financing structure can be estimated, as well as the effect of different input variants and parameters made on results can be evaluated. The model is not intended to record general rules of decision making, but it aims to give practical help, organizing relevant information and providing support for decision making. During model editing process, I aimed to integrate empirical and professional issues into the model, considering recommendations of the scientific literature (BOITY et al., 2001). The calculation model has been built up by connecting its elements (its sub-modules) following a systematic approach, using a block structure (CSÁKI–MÉSZÁROS, 1981). As a result, each phase of the financing process in the model appears in single blocks.

2.3. Simulation carried out by the calculation model of trading house financing structure

During the research, I have carried out Monte Carlo simulation, using my own calculation model of financing. This allows extensive sentitivity analysis of factors affecting trading house financing structure, helping possibly the most substantiated decision-making. During the research, sensitivity analysis aimed to give numerical data showing how input data of the model (prices on the commodity market, funding parameters) affect collateral value of the financing process, and defining effect, measure and direction of the factors that influence coverage ratio.

I have carried out a simulation test of the financial model, using data about corn and common wheat, the two most important types of grains, if we consider their role as collaterals in commodity financing. I aimed to give a sufficient evidence for funders to make them capable of being able to evaluate the collateral and guarantee value of grains, and calculating the discount values and rate of financing, in the context of expected price movements. Further aim of examining these two agricultural products was to identify the role of variables that affect coverage ratio of the presented financing structure, even if there are different commodity types.

For defining probability distribution, which is absulutely needed for the simulation, I have used the data published by the Hungarian Central Statistical Office (about corn and common wheat), while in case of reference rate, historical data about rate fixing (BUBOR) between the years 2005 and 2010, published by the Hungarian National Bank were used.

For defining the needed variables, I have applied the *fitdistrplus* program (R programming language and environment). The following statistical contexts were used during the derivation of my research:

Price and interest rate data of a given period have been cathegorised into different range of values. As a result, I obtained the frequency of subsciptions, I have defined the likelihood of those based on experience and the characteristics of their shape distribution, as well as asskewness and kurtosis. Having represented frequency and cumulative distribution of the data collected during the examination, using the *Bootstrap* method,

added to the few existing samples, I have generated 100 further values, by which I aimed to extract as much useful information as possible to examine the matching of distribution functions.

To plot the distribution of given values (square of kurtosis against skewness) I have used a *Cullen and Frey graph*, which selects matchings with possible probability distributions. Subsequently, I have used *Kolmogorov-Szmirnov*, *Cramer-von Mises*, and *Anderson-Darling* statistical testsing to check probable distributions based on the graph. Since different tests do not produce the same results in some cases, I have used three different methods. Organizing into a matrix, I have analyzed results of the statistical tests, and I have used a graph to plot the matching of the hypothetical distribution and empirical data. Besides distribution frequency, I have plotted cumulative distribution, as well as so called *Q-Q plot* and *P-P plot* graphs. This way, one can check matching of the expected distributions.

To carry out Monte-Carlo Simulation, using *mc2d*[1] program of system R, I have made 5,000-5,000 runnings, using distribution parameters, which were gained by distribution testing of the two mentioned products. These runnings have been carried out by supposing funding maturity 6, 9, and 12 months (180, 270, 360 days) long, and a security deposit of 10, 15 and 20 per cent, focusing on the coverage ration at maturity.

Table 1: Scenarios applied during the simulation

Funding maturity (month)	6			9			12		
Basic price (purchase price)	1.	2.	3.	1.	2.	3.	1.	2.	3.
Security deposit	10 %								
	15 %								
	20 %								

Source: Own construction

Based on practical experience and the fact that the structure guarantees finance opportunity within a year, I have determined possible maturity at 6, 9 or 12 months. Measure of the security deposit has been defined on the same basis.

Overall, I have evaluated the results of 135,000 runnings (based on the 27 variants represented in Table 1), regarding each type of products. By logging the given values, I have made the analysis of their statistical parameters, such as lower and upper quartile,

[1] Monte Carlo Deux Dimensions

coefficient of variation, range, IQR[2] value, quartile values at 2,5% and 97,5%, confidence interval, kurtosis and skewness. Plotting a graph on frequency distributions histogram and boxplot graph, I aimed to demonstrate if value could be classified as an outlier.

Since input variants have a common effect on results of the scenarios, I have analized the significant and hypothetical connection existing between them, using multi-variable regression analysis. By regression calculation, I have tested whether there is a connection, and if yes, how the followings are linked to each other: coverage ratio of funding, trends in the basic price of funding, maturity of funding and measure of the security deposit.

During regression, explanatory abilities of the independent variables (maturity, measure of security deposit, basic price of funding) could be controlled by analysis of variance concerning regression. Defining the variances of differences caused by the different effects, then the significance level belonging to F-test, I was able to give an answer to the question whether the result variable (the variance of coverage ratio) can be explained sufficiently by the independent variables.

I have carried out correlation calculation to assess the degree of linking between dependent and independent variables applied during the simulation. After having defined values R and R^2, it was possible to discover from the correlation matrix, whether dependent and independent variables were linked together, and if yes, how strong the link was between them.

[2] Interquartile range

3. MAJOR FINDINGS OF THE DISSERTATION

As a result of specificities and the seasonal nature of agricultural production, and the insufficient equity capital endowment of agricultural undertakings, agrucultural businesses continuously need foreign sources in order to ensure an appropriate level of liquidity. In agricultural financing – its liabilities are approximately 1000 billion forints – banks play an active role with 42 % of funding. The remaining financing transactions are linked to other economic operators, such as market operators, whose role is to act as intermediaries in transactions carried out with participation of commercial banks, and other, non-professional funders, who are independent from financial markets, and who ususally act closely adjacent to the businesses (suppliers, customers, members of the agricultura business).

Financing forms which guarantee indirect banking activity (financing through integrators, leasing, factoring and trading house financing) are operating mainly because of legal and economic reasons.

Due to their conditions and legal environment, a segment of agricultural businesses can be funded by commercial banks which are usually out of the customer base of banks, since they mean high risk (KEMÉNY et al., 2010).

3.1. Trading house financing structure – structured trade finance

Funding needs of agricultural undertakings mainly origin from the specific current assets management of agriculture, the composition of current assets and their circulation. For agricultural businesses which are lack of sources, working capital credits ensure the basic sources for day-to-day operation.

There are several definitions for trade finance. Generally accepted, defined by the UNESCAP (2003) as it follows: trade finance is the art of risk-management, where risks are controlled by the bank through the structure of financing, and are transferred to customers, who are able to bear them.

There is no conclusion even in the literature about what products, financing instruments and methods belong to the frame of trade financing. By the banks transactions of letter of credit, different debt financing techniques (factoring, forfait), and different commodity finance transactions are classified here.

In case of structured financing, stocks to be funded and the cash flow generated by them must be isolated from other stocks and activities of the company, their creditworthiness and financial sustainability must be evaluated separately, for the purpose of mitigating risks (LEE, 2004). Synthesizing the definitions of *Structured trade finance* that can be found in the insufficient number of international literature on the topic (MACNAMARA, 2001; MOORS, 2003; GRATH, 2011), the following elements can be highlighted:

- Short-term, one-time or recurring, mainly commodity-based, usually (back to back) form of current assets funding, with fixed loan;
- The structure and the guarantees assure the funder's control and dispositional authority over the goods and the cash flow deriving from the transaction;
- The funder can monitor the movements of goods (in whole or in part);
- Strict monitoring of the funded transaction, in order to ensure a rapid response;
- The collateral of repayment of the sources giving the basis of the financing transaction is deriving from the sales of goods. Debtors ususally do not have other sources;
- It is a structure with well-defined risks.

Therefore, it can be said that structured commodity finance in many cases – but not exclusively – is relevant to businesses that cannot be funded based on balance sheet or above given limit. In such cases, risks deriving from lending are offset by the adequate structured financing construction and strong guarantees.

In the last few years, it has become apparent for the funders that finance based on balance-sheet serves neither the businesses in a fully customized way, nor the banks, which aim to reach the maximum security of lending. In many cases, usual forms of financing cannot be applied because of the lack of customers' creditworthiness. It was worth for funders to develop structured forms of finance, which aim to finance production and trading of the following products: sectorspecific products, which can be taken to the stock market (grain, fertilizer); marketable finished products (products of canning industry); large-volume raw materials and fuels (so called commodity products). This type of current assets financing makes an attempt to develop ring-fenced constructions of loaning and solutions for financing, so called indirect loaning.

As a result, the developed constructional transactions provide the most suitable financial solution, monitoring the supply of raw materials, manufacturing and keeping track of finished goods.

Trading houses – similar to firms with the same profile, belonging to banks (e.g. factoring houses) – are firms specified to projects (trading house), which is able to carry out own-account transactions, as a result, they can serve as means in funding transactions, which aim to acquire property right, so choosing the most appropriate or the only possible solution for lending. Commercial banks can apply trading house financing on the following fields:

- normal business activities,
- tool aiming to strengthening structure of guarantees, related to credit transactions,
- tool of activities aiming to perform restructuring and/or work-out.

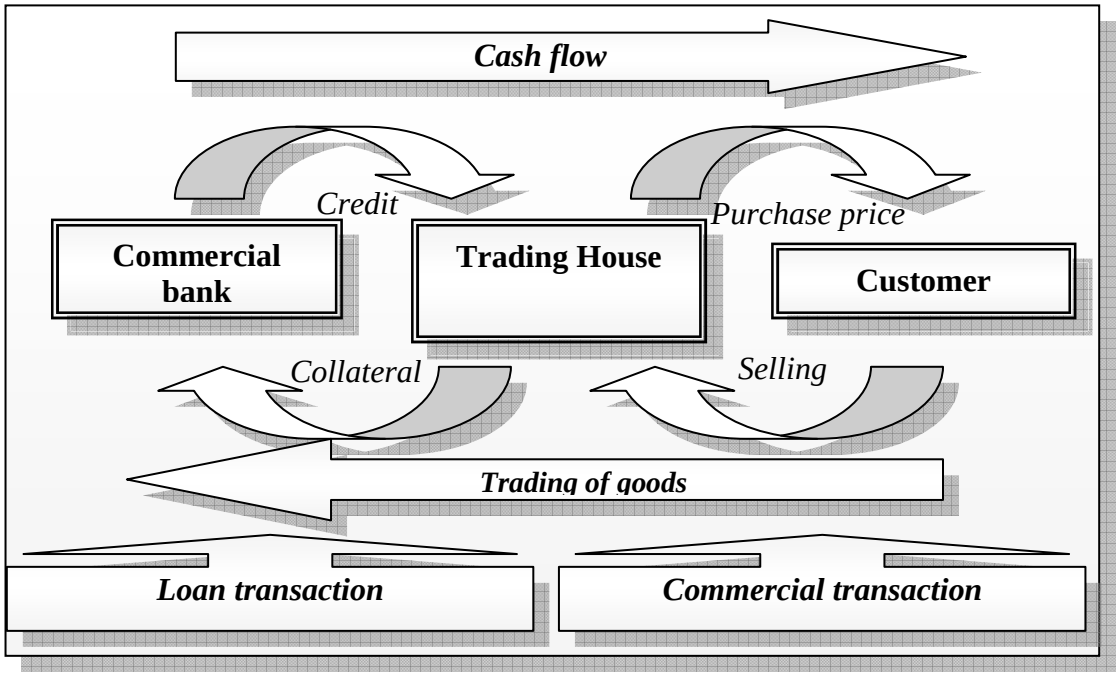

Figure 1: Basic process of trading house financing

Source: Own construction

The business model of trading house financing (Figure 1) builds upon the price difference deriving from purchasing and reselling of goods. In order to retain the closed nature of the structure, trading houses, when purchasing the goods, make two optional contracts at the time of conducting the sales contract. On the one hand, they grant short call option right to the seller, guaranteeing that they can re-purchase the goods during life of the issue, on

the oher hand, they establish a long put option right in order to minimizing risks. The latter one means liabaility to buying on behalf of the seller. This option provides a contractual guarantee that provides the stocks' depreciation, in case of increased risk.

As a result of using security deposit as a guarantee, during price formation buffer is provided at a level that provides trading houses the ability of managing stop-loss cases in a safe manner, covering their losses that originated from market processes. Amount of the security deposit and level of stop-loss is defined on the basis of commodity risks, earlier volatility of commodity prices, the customer's rating and the rating of the place used for storing the stock.

Institutions concerned with trading house financing are related mainly to business partners of capital intensive industries, which are prominent operators of their industries, such as exporters, wholesalers, energy suppliers, integrators or producers working in agriculture, and food producers. They are involved mainly in producing and trading with commodity products (products of agricultural industry, fuels, products of steel industry), which are produced by using simple technologies and are easy to sell. Only those homogeneous and current products can be funded that have transparently measurable market prices and pricing, and that can be controlled by quality control instruments.

In case of trading house financing transactions, future cash flow from selling of the goods give the source of repaying the loan. Normally, the transactions can be divided into three sections. *Purchasing* of goods is the first phase, which is followed by *holding in stock* or *production* (second phase). In the closing phase of the transactions, through the cash flow generated by *selling* of the goods, repayment is started. The stock turnover period varies considerably, depending on industries, type of stocks and activities.
In the closing (selling) phase of trading house financing structure, from legal, commercial and accounting point of view, trading companies can choose from different possibilities of selling the goods (selling by option; commission structure; customer allocation; free market sales).

3.2. Calculation model of trading house financing

With the aim of mapping the effects that influence trading house finance, I have developed a financial calculation model, in order to facilitate informed decision making. Applying the model, the following factors can be determined: cash flows from the transactions; timing of cash flows and their distribution between the funder and the customer, in accordance with the guarantee structure. It aims to examine changes of the funding parameters under different business conditions, and to what extent these changes increase risks deriving from changes in collateral level.

Input variables of the model – in accordance with phases of the funding structure – can be grouped as it follows [with their symbols in square brackets]:

- Input data of purchasing and payment to be established:
  - Assets as collateral, in naturals (ton, piece) [*K*],
  - currency used in financing operations (HUF, EUR, USD),
  - net purchase price of the stocks used as collateral for price units (currency/ton, currency/piece) [*Pá0*],
  - value added tax (%) [*VAT*],
  - security deposit (%)[*ó*].
- Inputs of finance costs (holding in stock, processing):
  - length of financing period[3] [*N*],
  - reference interest rate (% p.a.) [*k.ref.*],
  - margin (% p.a.) [*k*],
  - measure of handling fees (%) [*kk*],
  - other costs (storing, hiring) [*ke*].
- Inputs relating to refinancing:
  - refinancing reference interest rate (% p.a.) [*k.ref.*],
  - refinancing margin (% p.a.) [*ref.k*],
  - handling fees of refinancing (%) [*ref.kk*],
  - contract fee (%) [*szerz.k*],
  - commitment fee during refinancing period [*rt.*].
- Inputs relating to collateral monitoring:
  - amount of receivables [*Kö*],

[3] maximum 360 days

- discount rate of receivables (%) [*Ködr*],
- sold stock volumes [*Ké*],
- stock volumes under processing (ton, piece) [*Kf*],
- processed stock volumes (ton, piece) [*Kú*],
- unit prices of stock volumes (currency / ton, currency / piece) [*Kúá*],
- current market prices of the stocks used as collateral for price units (currency/ ton, currency/piece) [*Pá*].

Some so called ’sub-outputs’ of the model act as further input data in the model, but their values provide essential information for the user (market operator), all output factors are worth grouping:

- Results and outputs relating to financing:
  - amount for financing [*F*],
  - fees of financing, indexing [*Fk*],
- Results and outputs relating to refinancing:
  - fees of refinancing [*rFk*],
  - results of refinancing [FE].
- Results and outputs relating to collateral monitoring:
  - collateral value of the stocks [*Fké*],
  - collateral value of receivables [*Fkö*],
  - collateral fund [*Fa*],
  - coverage ratio (%) [*Fr*].
- Results and indications relating to selling:
  - option net unit price [*Óá*],
  - amount of trading house claims which are needed to be met financially [*PK*],
  - Stop-loss price level indication.

The financial model applied during funding is able to calculate with risk premium allocated to the warehouse, similarly to exchange rate risks, by applying and weighting of relevant objective and subjective factors.

Calculations, correlations and data trails applied by the model are depicted by Figure 2, using the markings used above.

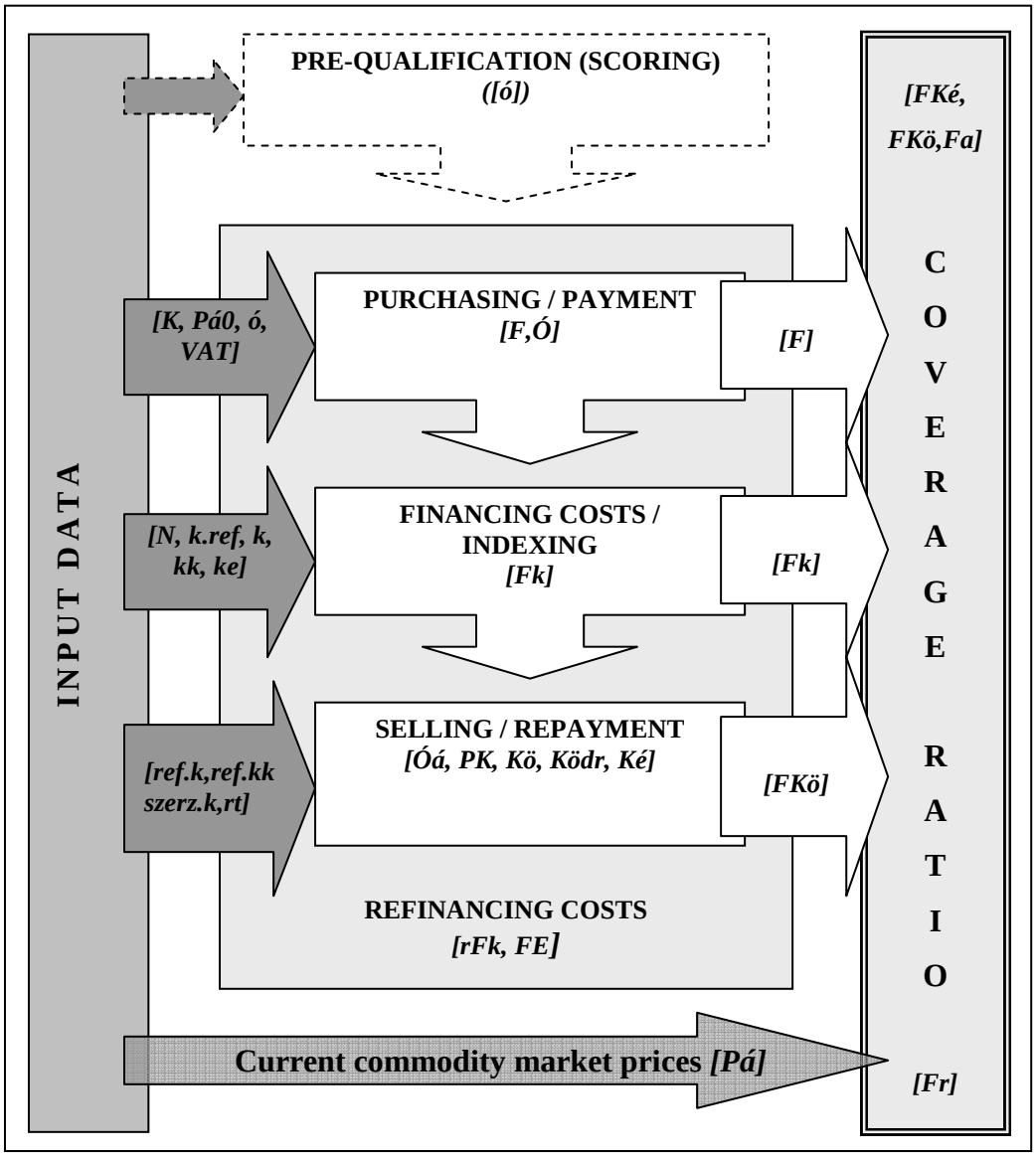

Figure 1: Operation of the model
Source: Own construction

Calculations of the model appear on six Microsoft Excel worksheets, while remarkable risk factor data affecting the structure can be depicted on an additional worksheet (Pre-Qualification), as a result, there is an opportunity for reducing risks. The extent of financial security deposit specified here depend on the followings: discount price predefined by volatility of the given type of product; customers' rating; and rating of the stocks' storage area.

Different sheets provide decision supporting information that can be useful for the market operators. As a result, the refunder, the trading house and the clients can use different sheets for accounting and collateral verification.

3.3. Simulation test of the trading house financing model

In order to carry out Monte-Carlo Simulation testing with the model described above, variables, their possible intervals, probability distributions and relations of the variables must be fixed.

During the analysed period, corn price data and distribution of prices represent a highly volatile market. Besides remarkable frequency of prices of 25-30 thousand HUF/ton, prices of 50-55 thousand HUF/ ton show high frequency, regarding both frequency and value.

Market price fluctuations of common wheat are even more hectic than that of produced by corn. Much higher maximum value and greater variety are added to the average value. Although for common wheat, the frequency of 25-35 thousand HUF/ ton is the highest price levels twice as much as this is common as well.

Evaluating the statistical tests, I have found that while the distribution of corn and common wheat prices showed lognormal distribution, the distribution of reference interest rate followed the Weibull pattern during the years examined.

Using the distribution parameters of the financing model, carrying out 5000-5000 simulational runnings of the 27 different scenarios, within 95 % confidence interval, the results referring to the covering ratio were as shown in Chart 2 and 3.

Chart 2: Average value of the coverage ratio distribution, on corn, with different financial security payments, funding periods and initial unit prices

		Funding period (day)								
		180			270			360		
		Basic price of funding (HUF)			Basic price of funding (HUF)			Basic price of funding (HUF)		
Security deposit	**Limit**	**28 000**	**34 000**	**39 000**	**28 000**	**34 000**	**39 000**	**28 000**	**34 000**	**39 000**
10%	**Lower**	134%	112%	99%	130%	110%	96%	128%	107%	94%
	Upper	136%	113%	101%	132%	111%	97%	130%	108%	95%
15%	**Lower**	148%	124%	111%	145%	121%	108%	141%	119%	105%
	Upper	150%	126%	112%	147%	123%	109%	142%	120%	106%
20%	**Lower**	162%	138%	123%	158%	135%	120%	155%	133%	118%
	Upper	164%	139%	125%	160%	137%	122%	157%	134%	119%

Source: Own calculation

Chart 3: Average value of the coverage ratio distribution, on common wheat, with different financial security payments, funding periods and initial unit prices

		Funding period (day)								
		180			270			360		
		Basic price of funding (HUF)			Basic price of funding (HUF)			Basic price of funding (HUF)		
Security deposit	**Limit**	**34 000**	**40 000**	**48 000**	**34 000**	**40 000**	**48 000**	**34 000**	**40 000**	**48 000**
10%	**Lower**	123%	107%	91%	121%	104%	88%	118%	102%	86%
	Upper	125%	108%	92%	123%	105%	89%	120%	103%	88%
15%	**Lower**	137%	119%	102%	133%	116%	99%	130%	114%	98%
	Upper	139%	120%	103%	135%	117%	100%	132%	115%	99%
20%	**Lower**	152%	132%	114%	148%	128%	112%	145%	125%	109%
	Upper	154%	134%	115%	150%	130%	113%	147%	127%	110%

Source: Own calculation

In the case of corn – with given price movement distributions, as defined above – the average coverage ratio falls below the minimum level required (100%), only if the amount of security deposits remains at the moderate level of 10%. It should be noted that funders usually expect a higher ratio, ensuring adequate guarantee of potential forced sale costs.

In the case of common wheat values, coverage ratio can be decreased below 100 %, even if the amount of security deposit remains at the level of 15%, assuming a 12-month-long maturity and high basic price of funding. Besides increasing financing costs, hectic price movements experienced on common wheat market, and, as a result, probable price reductions (i.e. reductions in the collateral value) play an obvious role in this.

Looking at the results taking into consideration the financing periods, one can state that if the maturity is extended, the collateral level is slightly decreasing. The root causes must be again the same: financing costs increasing pro rata temporis, and, due to the longer term, the high probability of decrease in commodity market prices. Calculations carried out by regression analysis provide opportunity for examining this issue.

Both of the products under investigation prove that increase of the basic price of unding shall result in decreasing of the coverage ratio. Thus, the higher the initial level of funding is (compared to the average values of the previous years), the more probabale is that a substantial fall of commodity market prices would happen, resulting in unexpected decrease of the collateral level. It is clear from the results, that this can be realized only in case of an extremely high starting basic price, which is almost 20 % higher than the average of the previous five years. In case of corn, it is 39,000 HUF/ton, while the average price was 33,000 HUF/ton during the period considered.

Using the distribution diagrams and the boxplot charts, I have concluded that there are some outliers, but the average values (95% confidence interval) show the probability of low additional hedge, at 94 % coverage ratio. These values can be managed by refining the model, which can be supported by sensitivity analysis. Thus, in case of extremely high initial prices, a higher, 15-20% reserves of prices can be justified, as well as the graded combination of these criteria.

Collateral values should not be ignored, since in many cases they are very high (140-160%). It can be stated that the results take high value (when the basic price of financing is low, in relation to the average prices of crop, the maturity is short (6 months), and there is a high security deposit (20%). Although in these cases transactions result in remarkable coverage surplus for the funder, from the point of view of the other party, the transaction, with its excessive reserve and low rate of financing, causes disadvantages, which can have a negative impact on the market position of the funder as well. In these cases security deposit should be fixed at a lower level, in accordance with current market prices and maturity, and correction should be carried out.

In the light of the results, it is obvious that it is possible to guarantee an acceptable collateral level during the whole maturity of funding, with a combination of the tested factors affecting the coverage ratio. Thus, the assumption in **Hypothesis 1** is supported.

As the results of the examined scenarios demonstrate, different variables have effect on collateral level in combination, not individually. In this case, we can examine by multiple regression analysis how security deposit, maturity and starting basic price affect the coverage ratio. As a result, in the case of corn, the value of the coverage ratio (*Y*, target variable) can be calculated by the following equation

$$Y = 208{,}44 + 25{,}78x_1 - 1{,}00x_2 - 0{,}0334x_3$$

in which the following regressors appear:

$x_{1:}$ measure of security deposit (%),

$x_{2:}$ length of maturity (month),

$x_{3:}$ starting basic price of fiunding (thousand HUF).

On the basis of the coefficients, it can be stated about the variables that, although the coverage ratio is influenced by all of the three factors, they have opposite effects. While in the case of the security deposit higher value results in higher coverage ratio, longer

maturity and higher basic price of funding implies decrease in the coverage ratio. Of independent variables, the measure of security deposit impacts the most the values of the coverage ratio – as it can be detected from the average values obtained in simulation. A unit increase of the security deposit – which, according to my calculations, equals 10 % security deposit – results in a 25 percentage points increase of the coverage ratio. A unit increase of the maturity (month) and the starting price (thousand forints) results in the 1,00 and 0.03 percentage points decrease of the coverage ratio.

Chart 4: Analysis of variance (ANOVA[4]) – corn

	Degrees of freedom Df[5]	Sum of square Sum Sq[6]	Variance Mean Sq[7]	F value	F test significance level
Security deposit	1	2990,2	2990,2	1132,46	<2,2e-16***
Maturity	1	162,0	162,0	61,35	6,151e-08***
Starting price	1	6082,2	6082,2	2303,47	<2,2e-16***

Source: Own construction Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Depending on the analysis of variance of regression (Chart 4), based on the significance level – the null hypothesis is rejected – the effects of all three factors must be taken into account and regarded as valid for the reference population. In other words, security deposit, maturity and basic price of funding significantly affect the collateral value, so the assumption of **Hypothesis 2** is accepted.

Relating to the closeness of linear relationship, based on the value (0.9967) of *R* correlation coefficient, the correlation between the variables and the changes of value of the coverage ratio is remarkably close. R^2= 0.9935, thus, the three explanatory variables together explain 99.35% of variance (fluctuation) of the coverage ratio (through the regression function).

The multiple regression analysis examination of the results deriving from the simulation carried out by using the data of common wheat led to the following results and function

[4] **AN**alysis **O**f **VA**riance
[5] Degrees of Freedom
[6] Sum of Square
[7] Mean Square

(using the same symbols as with corn), as regards how security deposit, maturity and starting basic price affect the coverage ratio:

$$Y = 187{,}69 + 25{,}222x_1 - 0{,}9444x_2 - 0{,}02446x_3$$

Having examined the significance levels belonging to the t-value of the different variables, I have detected the significant effect of all variables, also for common wheat. Although measure of their effects is different from the results observed in the case of corn, all three tested variable factors affect the coverage ratio, and they affect in the opposite directions, which factor is similar to the results observed in the case of corn. On the basis of these results, **Hypothesis 3** is partly rejected.

A unit increase of the security deposit results in a coverage ratio increase of 25.22 percentage points. A unit increase of the maturity and the starting price (month, thousand forints) results in a coverage ratio decrease of 0.944 and 0.024 percentage points.

4. CONCLUSIONS

Parallel to the increasing price levels of commodity markets, it is necessary to apply more reasonable and more moderate financing rates. Range of values must be determined on the basis of commodity prices of the previous years, information about stock-exchange futures and the distribution of prices. The model and the function made by the related regression analysis can give a basis and assistance for determining the measure of security deposit for the different range of values (Chart 5). Given the planned maturity, in accordance with the price of the funded agricultural product and the many years' distribution of the interest rate, it is possible to tell the likely trends of the collateral level.

Chart 5: Minimum values of the buffer (security deposit) in order to complete 100 % of the collateral level, in the case of corn, observing different price levels[8]

Basic price of funding (HUF/ton)	Maturity (month)						
	6	7	8	9	10	11	12
30 001 - 32 000	0,43%	0,81%	1,20%	1,59%	1,98%	2,37%	2,75%
32 001 - 34 000	3,02%	3,41%	3,79%	4,18%	4,57%	4,96%	5,35%
34 001 - 36 000	5,61%	6,00%	6,38%	6,77%	7,16%	7,55%	7,94%
36 001 - 38 000	8,20%	8,59%	8,98%	9,36%	9,75%	10,14%	10,53%
38 001 - 40 000	10,79%	11,18%	11,57%	11,96%	12,34%	12,73%	13,12%
40 001 - 42 000	13,38%	13,77%	14,16%	14,55%	14,93%	15,32%	15,71%
42 001 - 44 000	15,97%	16,36%	16,75%	17,14%	17,53%	17,91%	18,30%
44 001 - 46 000	18,56%	18,95%	19,34%	19,73%	20,12%	20,50%	20,89%
46 001 - 48 000	21,16%	21,54%	21,93%	22,32%	22,71%	23,10%	23,48%
48 001 - 50 000	23,75%	24,13%	24,52%	24,91%	25,30%	25,69%	26,07%

Source: Own calculation

Evaluating the hypothesis of my research through developing the model and carrying out the simulation, it has been concluded that:

Hypothesis 1: Developing an adequate structure of securities, the expected level of coverage can be guaranteed with commodity finance transactions, during the entire repayment period.

Result: Accepted

[8] Provided indications refer to the given product, assuming the distribution determined above.

Explanation: Based on the results of the research carried out by the developed model, it is clear that there is a combination of varying parameters that guarantees the collateral value expected by the funder, during the whole repayment period.

Hypothesis 2: The following elements are related to each other: the coverage rate of funding, the basic prices of funding, the repayment period and the extent of security deposit.

Result: Accepted

Explanation: Carrying out regression analysis and, with the regression concerned, variance analysis, it is possible to identify the explanatory ability of the factors that were identified and supposed during the risk evaluation of the inputs belonging to the developed model. The equation that determines value of the collateral level as a target variable in accordance with the regressors, gives the effect and the direction of the different variables.

Factors affecting the model of trading house financing (rate of financing, maturity, extent of the security deposit) explain 99.4 % (for corn) and 98.9 % (for common wheat) of the simulation results.

Hypothesis 3: In case of different products, differences can be detected in connection with measure and direction of the factors affecting the coverage ratio.

Result: Partly accepted

Explanation: Based on the results of simulation and regression analysis carried out with the developed model, it is clear that measures of the effects belongigng to different factors led to (not significantly) different results. However, directions of the effects are the same.

In my opinion, it is needed to investigate other types of products (even goods from other sectors, apart from agriculture, e.g. steel, durable food products) in order to gain a satisfactory evaluation of the assumption of the hypothesis, but in the present paper limitation of scope does not give the possibility for the further investigation.

Hypothesis 4: Due to finance costs incurred and the price volatility risk of commodity markets, the length of repayment period can make remarkable differences as regards the coverage of financing.

Result: Partly accepted

Explanation: Looking at the results of the simulation I have founded that in the tested structure measure of the security deposit (namely, choosing the appropriate rate of financing) have the most remarkable effect on the collateral level (coverage ratio) of financing. This statement was confirmed by regression analysis, which has shown the less significant nature of interest charges (namely risks, emerging from the growth of maturity). Thus, decrease in collateral level is not only caused by growing interest charges resulting from longer duration, but rather the probable price decline on commodity market during the repayment period.

5. NEW AND NOVEL SCIENTIFIC FINDINGS OF THE DISSERTATION

5.1. The role of trading house financing structure in trade financing, the process of the financing structure and its application

In my dissertation I have examined the possible structures of trading house financing, I have organized the alternatives of purchasing, stocking and selling, relevant in the overall financing process.

I have described the legal aspects of the contracts in the structure, their guarantee scheme, applicable conditional requirements, costs, the necessary monitoring activity aiming to mitigate the relevant risks, and I have made proposals for the applicable procedures. I have detected the risks, operating conditions, legal environment and economic importance, taking into consideration the different points of view of market operators.

5.2. Comparative analysis of different forms of commodity financing, focusing on business purposes and risks

I have defined the place of trading house financing structure among other financing structures, comparing it to the other, traditional forms of commodity financing, highlighting its advantages and disadvantages from risk management and business point of view.

5.3. Developing the decision-making aid calculation model of trading house financing structure

Based on trading house financing structure, I have developed a calculation model, which serves as a decision-making aid for market operators involved in the structure (funded undertakings, trading houses and operators of refinancing), providing information readily available on the fees and results of funding and their covering position, as a result, decreasing the level of risks, and providing a suitable basis for making rational business decisions.

5.4. Simulational sensitivity analysis of the decision-making aid calculation model of trading house financing structure

By simulation carried out on the developed financial model – applying probability distribution – I have conducted sensitivity analysis, focusing on the two major commodity products (corn, common wheat), taking into consideration different maturity, starting basic prices and starting collateral levels. Analyzing its results, using amongst others regression analysis, I have evaluated measure and distance of factors affecting the structure.

6. THEORETICAL AND PRACTICAL BENEFIT OF THE FINDINGS

Over the past decades, due to risks different from the ones existing in traditional company financing, and as a result of its special conditions of financing, agricultural financing enforced market operators to apply new assets, collaterals and a new assurance structure of funding.

Trading house financing transactions show significant differences form the ones conducted within the frame of traditional corporational lending. The examined structure can serve as a solution for those undertakings that, with limited creditworthiness, have liquid goods of uniform quality, in large volumes. Thus, those of looking for funders and sources, are able to acess short-term sources, significantly improving their liquidity, balance-sheet, and even their stock management. Moreover, with the application of the structure, both the trading house and the bank in charge of refinancing can obtain the return expected on financial market.

Trading house financing secures a competitive advantage for banks, since, on the one hand, through the ownership of the products serving as a security deposit they acquire higher credit protection than through most of other collaterals (e.g. lien) provided by banks, and, on the other hand, they have ready access to the goods. Furthermore, customers can be funded over their limits, and, if it is needed, work-out transactions and those ones being in the preliminary, intensive (restructuring) phase of their management (e. g. collateral transfer) can be handled rapidly and flexibly.

Using the structure, banks can finance businesses that, because of existing bank loans, have no traditional collaterals (e. g. real estate), but buying out their certain stocks, they can obtain additional financing.

The financing structure and the model described above improve business opportunities of funders, help agricultural businesses to obtain financial sources and serve as a solution for collateral problems of short-term financing, and:

- optimization of stock management;
- choosing the right time of selling;
- end-of-year balance-sheet-optimization of businesses.

Managing exchange rate risks by commodities is undermined by the fact that in the region almost none of the commodity products have real liquid futures market. Moreover, both from the funders and the entrepreneurs, it requires suitable qualification, information infrastructure for handling data, and, last but not least, some source for capital allocation.

The presented form of funding and the simulation carried out on a calculation model applying its factors provide a sufficient basis, so as the trading house and the operator involved in refinancing can evaluate the effects of exchange rate risks. Moreover, they obtain information about the likely trends of collateral level during the repayment period. The model provides information, thus, it serves as a decision-making aid for the trading houses (funder), the funded undertakings and the operators of refinancing (typically, financial institutions).

The model, using simulational sensitivity analysis, allows additional opportunities for estimating the collateral level (coverage ratio), taking into consideration the different combinations of parameters (maturity, starting basic price of funding, reserves for financing/security deposit), studying the effects of the parameters, calculating with different types of goods (having historical quotions). From the funders' point of view, calculating with price movements of the commodity markets, increasing costs of funding during maturity and interest rate movements of the financial markets, the model allows opportunities for optimizing the conditions of financing transactions, even in the preparation phase.

In order to make the different forms of commodity finance generally available for the businesses, and provide a source of low- level risk, stocks and goods giving the basis of funding must serve as appropriate and guaranteed collateral for the funders as well. That also involves up-to-date information about the collateral value, the collateral level and factors affecting it during the whole repayment period, as well as statistical analysis of these factors, and funding market confidence towards the activity of the institutions (e.g. public warehouses), taking part in or supporting the different constructions.

7. PUBLICATIONS IN THE SUBJECT OF THE DISSERTATION

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9. **Suták P.** (2011): The grain as loan collateral, In: Erdei Ferenc VI. Tudományos Konferencia, Gazdaság, Ökonómia Szekció Kecskeméti Főiskola, Kertészeti Főiskolai Kar,Kecskemét, 2011. augusztus 25-26., I. kötet, pp. 76-80. (ISBN 978-963-7294-98-3)

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14. **Suták P.** (2008): A kereskedelem- és készletfinanszírozás, In: Argárium, Agrár- és piacgazdaság, Szaktudás Kiadó Ház Zrt., Budapest, 18. évf. 2008/5. május, pp. 22-23. (HU-ISSN 1215-8380)

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