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The Risks of Project Finance – Based on International and Domestic Experiences

SUMMARY: The risk analysis of project finance and its methodology have been continuously developing over the past two decades, in response to the sharp increase in financing volume. The aim of this study is to summarise the special risk structure of projects, the approaches to risk analysis, and to present the risk characteristics of projects and lessons learned, based on market data. Using international empirical analyses as well as processing Hungarian public banking data, the most important international and Hungarian market trends, risk characteristics, bankruptcy statistics, and returns are analysed, along with all major lessons of the recent years. One of the conclusions of the study is that project finance differs from normal corporate lending in many key aspects of risk. There is a clear separation between the risks involved in the execution and the operational phases, and this separation is not emphasised by the risk models used. Hungarian data are in line with international experiences, and are proof of the higher degree of risk inherent in project finance. When compared with normal corporate loans, default statistics show a much more unfavourable picture, which has severely impacted the average default statistics of the entire Hungarian banking system.

KEYWORDS: project finance, risk, risk management, bankruptcy

JEL CODES: G21, G32, G33

There is extensive literature, textbooks and other publications available on the definition, structure and characteristics of project finance. The definition of project finance itself can be found in every book on basic project finance (Yescombe, 2013; Nevitt-Fabozzi, 2000; Gatti, 2012), in market analyses on project finance (Moody's, 2013), in Hungarian professional literature (Horváth et al., 2011; Madácsi–Walter, 2014; Walter, 2016), and even in regulatory literature (see also: CRR). According to the general professional literature, as a rule, project finance is the financing of a legally independent company's (SPV, project company) investment into a specific activity

without (or with limited) right of recourse. The investment typically lasts for a finite, defined period. There are further structural characteristics of project finance which are also closely related to risk and risk management, such as the contract-based structure, the cash flow-oriented approach – as opposed to general corporate financing, which is based on normal corporate operations, traditionally analysed via balance sheets and assets – as well as the higher debt ratios and generally longer repayment periods when compared with normal corporate loans (Gatti–Rigamonti–Senati, 2007).

“Special Credit Exposure” is also defined in the Basel Directives, project finance being one of its named classes. In view of the above, special credit exposures shall be assessed separate-

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ly from normal corporate loans at institutions which apply the internal ratings-based methodology (Szenes – Tomsics – Kutasi, 2017).

The directive defines several groups, of which two – commodity finance and (partially) object finance – do not fit into the general definition of project finance. At the same time, project finance and real estate finance appear as separate categories, even though banking practice places both of them firmly within the area of project finance (EBA, 2016).

A significant amount of theoretical and practical professional literature deals with project risk assessment, including both the theoretical and the practical risk management process, as well as risk evaluation. The following chapter gives a brief summary of the above, as found in the relevant professional literature. After this summary, the volume, trends and characteristics of the project finance market are presented based on the available international analyses and processed Hungarian data. Subsequently, risk-related conclusions will be analysed, using comparisons of international and domestic data.

RISK ANALYSIS AND RISK ASSESSMENT IN PROJECT FINANCE – LITERATURE REVIEW

According to Standard and Poor's (2001), a project risk assessment should consist of six general steps.

- ① A joint examination and analysis of the operative and financial contracts of the project, and of the physical site.
- ② An assessment of construction, technology and operation
- ③ An analysis of other competitors on the market and of the project's market position
- ④ A partner risk assessment (both for customers and suppliers)
- ⑤ An analysis of the legal structure
- ⑥ An analysis of cash flow and of the relevant market and financial risks

According to *Ravis* (2013), the project finance risk analysis should consist of three steps, similarly to the process outlined for general corporate risk management.

- ① Risk identification and assessment
- ② Risk allocation and transfer
- ③ Analysis, management and mitigation of any remaining non-transferred risks

The aforementioned three points are discussed in more detail below.

■ The first step is to *identify the relevant risks (1)* and assess to what extent a given risk factor affects the solvency of the project. At this stage, both the probability of a given risk and its anticipated effect should be assessed at the same time. This concept is synonymous with the correlation $EL=PD \times LaD$,¹ frequently mentioned and applied in the quantitative assessment of credit risks. The same approach can be seen in methods aiming to quantify the credit risk, e.g. where risk score matrixes and risk levels are identified for specific projects (Gatti et al., 2007).

■ The *allocation of risks (2)* for the project in question takes place in the second step. The most efficient means of allocation typically used in project finance is a contract-based system. Its name refers to contract-based financing, a typical characteristic of projects. A great number of risks must be transferred to partners within the contract-based system to allow the project to be financed by creditors. Slightly modifying the logic found in classical professional literature (see: Madácsi–Walter, 2014, p. 124), which defines risks based on a contractual structure, we have now modified our classical project structure chart to illustrate the identification and allocation of risks. (See *Figure 1*)

I do not intend to further analyse the individual risks in this study, as almost all of them are obvious as displayed on the classic figure. Two aspects should be highlighted, however.

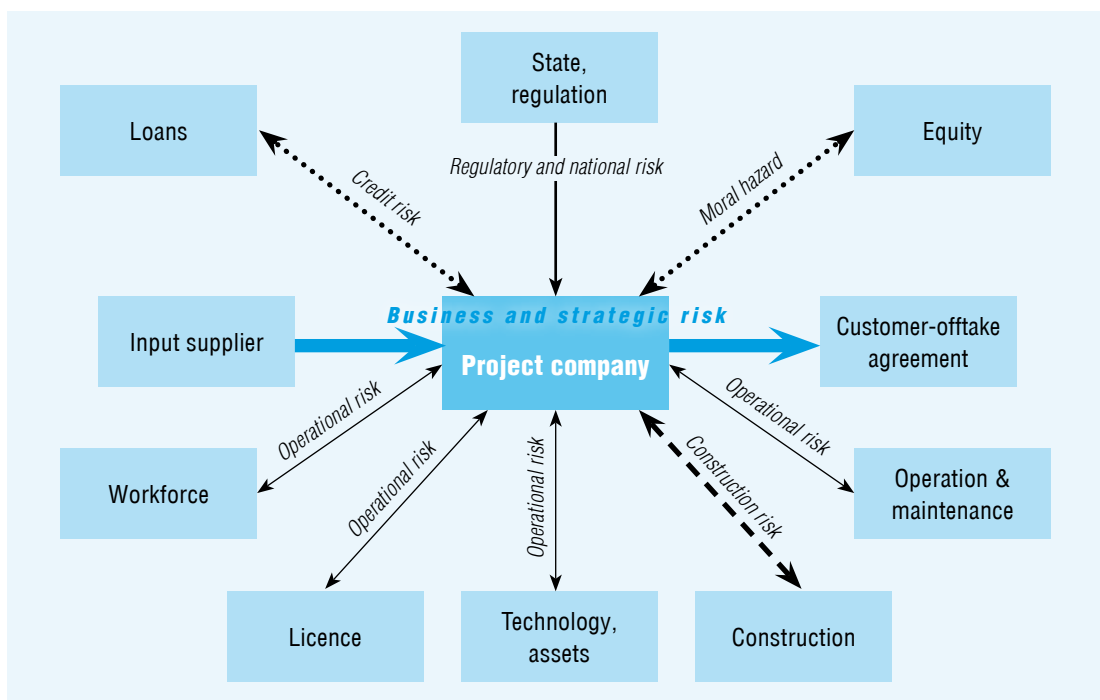
One of them relates to distinguishing between risks relevant to the execution/construction phase, and those pertaining to post-operation constructions, i.e. the business model. Essentially construction/performance risk lasts until project launch and the start of CF production. Implicitly, construction risk and certain factors regarded as operational risks (e.g. whether a type of technology or licence actually functions) also belong to this aspect. Subsequently, project launch essentially depends on the elimination of business and strategic risks, complemented by certain elements of operational risk. Due to the nature of the projects, project failure due to business and strategic risks may occur immediately after the end of the construction phase, or even before if it is discovered earlier that the project is commercially unviable. (For example, fewer offices of a commercial real estate can be let

than expected.) As evidenced by risk statistics, the aforementioned classification and analysis as per the aspects described above will be of primary importance for certain projects.

Another aspect, rarely mentioned in professional literature, is sponsor risk. High leverage projects involve a lower ratio of financial contribution from the owners. Any addition contribution is generally provided by companies which are themselves in debt, decreasing the available contributions. When discussing moral hazard, professional literature largely emphasises factors which can be solved by project finance, which consequently appears highly advantageous. Nonetheless, there are significant risks to be considered, as evidenced by the failed projects. A sponsor has a lesser degree of vested interest in maintaining the viability of the project or solving the problem than a creditor does. Due to the small degree

Figure 1

THE STRUCTURE AND ALLOCABLE RISKS OF PROJECTS



Source: own editing

of contribution, the lack of recourse rights, the limited liability – precisely the aspects most commonly listed as advantages – the owner will not necessarily be as motivated to achieve returns. The aforementioned phenomenon causes significant moral hazard problems for commercial banks and other creditors in practice as well. Nonetheless, the professional literature rarely deals with this issue. *Hal-dane* (2012) wrote about the negative effect of limited liability, describing the ‘incentive’ problem that occurs in project finance in his theoretical model *Tirole* (2006).

The aforementioned general structure is not the only one that can be used for risk identification; certain projects require a more detailed analysis. Elaborated methodologies have been published for such analyses of certain project types (e.g. construction projects). In the case of more complex projects, it is worth breaking down the entire risk structure to its elements by drawing up a type of risk tree. The risk breakdown structure and its applicability for construction projects is detailed by a number of professional works, including *Dikmen-Birgonul* (2006) or *Gatti et al.*, (2007).

In order to find financing for the project, all identified risks should be mitigated to a risk level acceptable to the financing parties. As most projects are largely financed using commercial bank loans, this equates to the risk level of bank lending. However, this level of risk allocation can only be achieved by means of a complicated and complex contract structure. For example, according to a survey conducted by *Esty* (2004), on average 15 participants are connected to the project company through 40 separate contracts or agreements. The high number of contracts alone entails significant project finance costs. These often interrelated contracts must be harmonised, which involves further cost increases.

■ The third step involves *managing non-allocable risks* (3). Professional literature (Ravis,

2013) emphasises the role of modelling and the establishment and detailed analysis of cash flow-based business plans. When writing about the aim of financial modelling for projects, *Anastasio* (2015) details that the models are not meant to predict the future, rather, their most important function is to identify risks, ensure a better understanding of the project structure, provide a more detailed analysis of the required project documentation and contractual relationships, monitor the projects, as well as to define the early warning signs. Regarding the reduction and coverage of non-allocable risks, the degree of equity sponsorship, the value and availability of securities (assets and reserve accounts) and several special covenants aimed at increasing cash flow coverage (e.g. sweep covenants) play an important role.

The logic outlined above (risk identification – risk allocation – management of non-allocable risks) explains the high leverage and indebtedness observable in project finance. Largely due to the single focus of operation, risks are easier to identify. By means of the contract system, most risks can be allocated to other partners. The remaining risks can be covered by well-defined and (where applicable) enforceable securities and assets. The aforementioned securities are complemented by equity contributions as needed.

As project finance is characterised by high debt ratios and a large amount of outstanding credit, the analysis and measurement of project lending risks has become a key aspect in corporate lending over the last decade for creditors, primarily banks. In addition to qualitative assessments, more accurate methods of quantitative risk assessments of project loans and the analysis and assessment of risk indicators have gained increased attention. While banks assess corporate loans using rating systems based on balance sheets, income statements, other reports and qualitative data, quantitative measurement methodologies and

instruments in the field of project finance are still evolving: see the aforementioned cash flow models. The difficulties arise from the fact that these are long-term, structured loans; each project is unique, has its own project contract structure, has no history that would serve as a benchmark, is hard to standardise and does not fit into common corporate rating systems (Gatti et al., 2007). The following part of our study investigates the risk assessment models for bank loans in project finance.

When describing the regulatory approach, it is worth reviewing the EBA (2016) guidelines. Based on the EBA guidelines, projects are to be assessed according to various assessment criteria. The assessment criteria categorise loans on the basis of financial strength, the political and legal environment, the characteristics of the transaction, the strength of the owner/sponsor and the securities package. The process and methodology above are similar to the assessment and classification principles applied by rating companies. Based on the results of the analysis for these categories, a given transaction is rated on a scale from 1 to 5, with 1 denoting strong fundamental, and 5 meaning default.

However, the Basel Committee also allows for the establishment of an internal model to adequately estimate the *probability of default* (PD), *loss given default* (LGD) and *exposure at default* (EAD) values of project loans. This model requires a different type of analysis and is probably in line with the banks' intention to better assess project risks based on their own model. The published and recommended models seek to assess project finance risks and the probability of default using cash flow simulation. Gatti et al. (2007) exemplify the concepts described above. First, they define the concept of default for a given project, then they proceed to determine its risk structure. Based on the risk structure, the most important input variables and risk parameters are then identi-

fied, analysed, and their distributions and correlations are estimated by means of historical and professional estimates. The results are incorporated into the cash flow model. Results are evaluated following a Monte Carlo simulation, by calculating the resulting VaR values. The estimation of the distribution and correlation of parameters is an essential element of the model. In order to facilitate said estimation, Chiara–Garvin (2008) recommend the incorporation of a general variance model. The suggested model for the improved estimation of the distribution of parameters includes options for assessing long-term uncertainty and learning during the process, and was presented in connection with the BOT motorway projects. The research approach published by Dong–Chiara–Kokkaew–Xu (2012) involves cash flow models, scenario analyses and Monte Carlo simulation approaches. As opposed to previous research focusing on the risk of individual projects, this approach assesses the joint default risk of infrastructure project portfolios.

Risk models use a different definition of default, and handle its occurrence differently as well. In the project financing risk models called structural models, default is defined as the value of the company's assets failing to cover the value of loans and external liabilities on the liability side. A basic example of the approach above is the default risk assessment model by Merton (1974). The *first passage* model pioneered by Black–Cox (1976) also belongs to the category of structural models. According to the first passage model, default occurs when the value of the assets side decreases below a specified critical level, even if the loan itself has yet to mature. The level is typically specified on the basis of one of the indicators or financial covenants. The above-mentioned cash flow models used for the assessment of project finance are largely based on this approach. In addition to structured models, the other main group of default models includes statistical,

also known as reduced models, according to which default cannot be derived from any change in the value of assets, rather, it occurs unexpectedly, with a certain probability. The reason for the default is treated as an exogenic variable, which is then calibrated to the market data. The literature on project finance does not include any examples for using such models.

Regulatory, risk-assessment and rating firms, e.g. Moody's, attempt to accurately define events and guidelines "officially" resulting in default. Such definitions are usually less exact, and often contain subjective elements as well. According to the definition, default is usually based on a 90-day lapse in payments related to a *material obligation*, or the occurrence of an event that is likely to result in insolvency. Several points of the regulation deal with the circumstances and definition of material obligation (Basel II., pp. 452–453). Moody's (2013) defines the occurrence of default similarly, describing events (delays in payment, the start of legal proceedings, restructuring), determining the probability of default accordingly, and giving further detail on all such circumstances (Moody's, 2013 p. 42).

The regulatory definitions of default apply to projects just as they do to normal corporate loans. As mentioned earlier, professional literature (see the cash flow models, above) also uses the structured, or more precisely, the first passage model approach for modelling project default. During maturity, the project can go bankrupt at any time if the cash flow is not sufficient for the given period. That is, the present value of project cash flow has to exceed a given level. According to this approach, which incidentally matches banking practice and regulation, project default occurs when free cash flow is insufficient to service the debt for a given period of time and/or if the present value of the expected future cash flow fails to cover the present value of the loan. According to these approaches, it is possible to explic-

itly define an indicator or covenant to protect the creditors' interests. For projects, these are largely measured and supported by involving various Cover Ratios (e.g. LLCR, DSCR, FSCR), indicators and covenants.

The following chapters will present risk statistics, with the data based on default definitions applied by regulators and Moody's. A description of the international and Hungarian project finance market will be followed by the risk characteristics and the lessons to be learned.

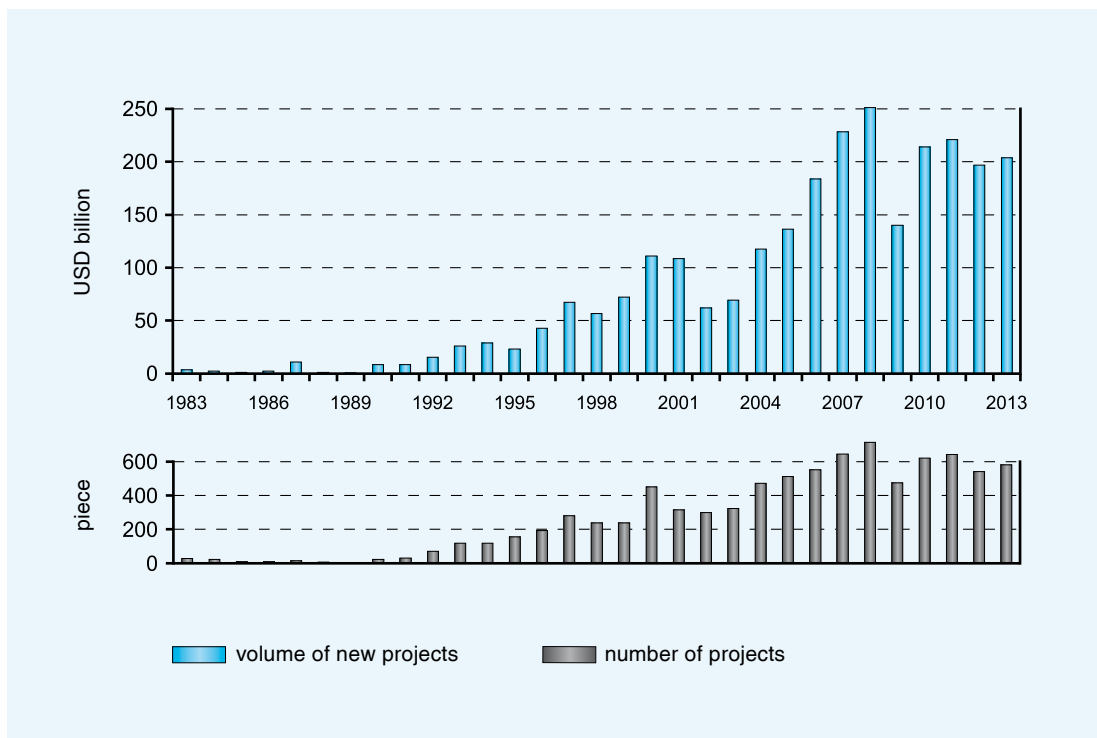
CHANGES IN THE GLOBAL AND HUNGARIAN PROJECT FINANCE MARKET

Articles on the history, role and significance of project finance invariably emphasise the fact that project finance already existed in ancient times or in the Middle Ages. Modern project finance is usually traced back to the 18th or 19th centuries. Likewise, the real ramp-up period of project finance is generally considered to be the 1970s and 1980s (Yescombe, 2013) Notwithstanding the above, upon review of the project financing volume of the past 15–20 years, it is evident that the financing provided before 2000 was dwarfed by the transaction volumes typical of the 21st century. The annual volume of new project financing has approximately quadrupled since the end of the 1990s, which means an even larger increase in cumulative volume, taking into account the fact that these are long-term, amortising loans. (See Figure 2)

The total cumulative volume of projects included in the statistics amount to USD 2600 billion over 7600 projects.² When attempting to estimate the actual total project finance volume and the number of loans secured, it is worth noting that these data certainly underestimate the actual values. That is because these statistics include only large amounts of

Figure 2

THE VOLUME AND NUMBER OF PROJECT LOANS SECURED



Source: Moody's (2013), DellaCroce–Gatti (2014), Csiszárík-Kocsir (2016)

(essentially syndicated) project loans traded in the secondary market. This is also evident from the average size of the projects. For example, a 2013 project amounted to USD 350 million, which far exceeds the volume of an average Hungarian project. Thus, the global statistics above do not include the volume of smaller-scale, directly financed projects, government projects or other guaranteed projects funded by financial institutions. Neither do they include the volume of project bonds, which have become increasingly popular over recent years and represent an additional source of funding of about USD 30–50 billion over and above the traditional syndicated project loans.³

Almost half of the projects are linked to North America or Western Europe, with South-East Asia representing the third largest market share, at 20 percent. Broken down by sectors,

two dominant industries, infrastructure and the energy industry, make up almost half of all the projects. Eastern Europe represents approximately 5 percent of the project finance market, with a total of 350–400 projects realised over the past 35 years (Moody's, 2013).

Direct, long-term statistics on project finance in Hungary are not available. In the light of the market, however, the number of Hungarian projects which could potentially be included in this large database due to their scale is very limited. Such projects would include, as an example, large-scale motorway investments worth several million euros, as well as motorway PPP projects. However, the majority of such project loans are not in the accounts of Hungarian banks, but are more likely to be on the accounts of parent banks participating in syndication financing, other

banks purchasing syndicated loans, or on the books of other market players. Since 2011, Hungarian banks have been supplying official data on the size, character and risks of the directly financed project portfolios on their books to the National Bank of Hungary. Consequently, it has been possible to analyse the market volume, risk character and trends of the project finance market since 2011.

Based on the data supplied by credit institutions to the supervisory authority (National Bank of Hungary, 2017), the gross volume of corporate loans (loans provided to non-financial companies by credit institutions) reached its peak of HUF 8000 billion in 2008, before the outbreak of the financial crisis. 2011 was a crisis year. The gross amount of loans provided by credit institutions to companies decreased, but not by a significant amount: to approximately HUF 7700 billion. Almost one third of this amount consisted of project loans, with a total volume exceeding HUF 2600 billion. This volume, along with corporate loans, has been eroding over recent years. By 2016, it amounted to only HUF 1500 billion, which still made up one quarter of the total volume of corporate loans. (See *Figure 3*)

No direct data are available on loans and trends previous to 2011. It is presumable, however, that in accordance with international trends, along with the amount of corporate loans provided by credit institutions, which more than doubled between 2002 and 2011, the volume of project loans would have also increased dynamically in the decade before 2011. In view of the continuously increasing competition in the market of domestic corporate loans between 2000 and 2008, the growing popularity of structured lending, and the expansion of structured financing classes, the hypothesis that project finance continued to grow as a ratio of corporate lending is almost certainly verifiable.

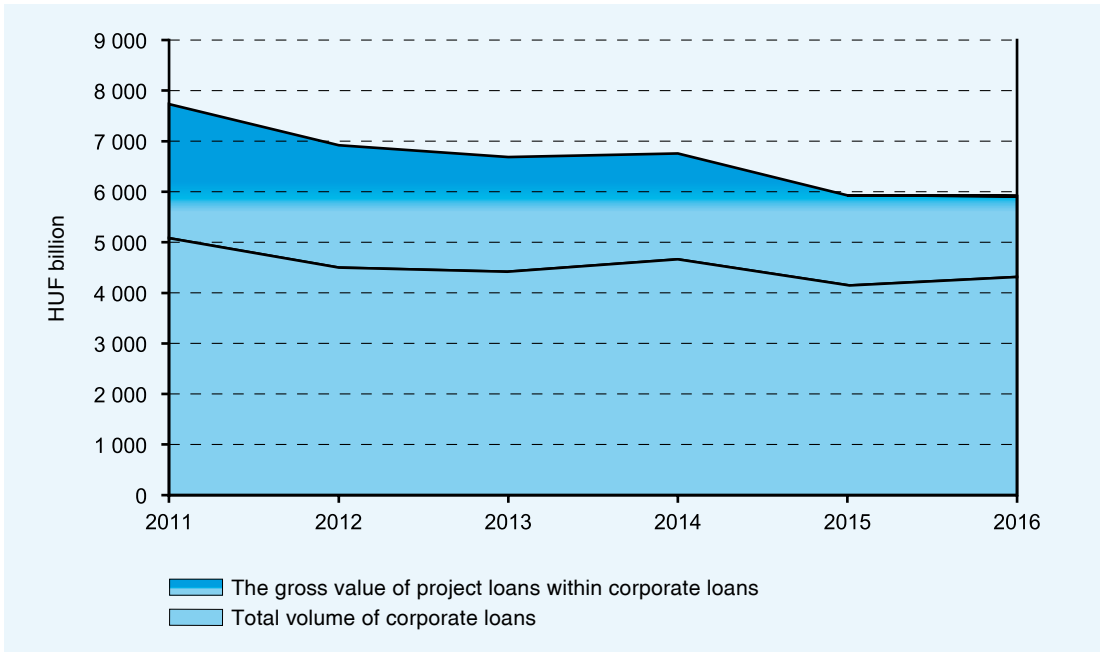
Sectorial distribution within the project fi-

nance portfolio supports the hypothesis and phenomenon published in international statistics that the majority of funding flowed into real estate projects. (See *Figure 4*) The financing of real estate development projects and real estate purchases (amounting to about HUF 1,600 billion) comprised more than half of the portfolio in 2011, the peak year of the crisis. Irrespective of loans provided to foreign entities and other mixed categories of loans, the second most significant projects after real estate were energy projects, which is also in line with experiences in large-scale international project finance. After 2011, the real estate financing portfolio entered a continuous decline. By the end of 2016, it had dropped by half, to HUF 800 billion. The only sector experiencing a return to 2011 levels of outstanding gross loans returning by 2016 (due to transactions in 2016) was transportation. In essentially all other sectors, the gross amount of outstanding loans showed significant decline. Naturally, net values also show important trends. The next chapter on risk will elaborate further on this topic.

Finally, it should be noted that this data still probably underestimates the true volume and role of project loans in the Hungarian market. Banks have to use the official Basel II definition to determine which corporate loans can be considered to be project loans. On the other hand, based on the provided supervisory information and publications, some bank-sourced categorisations turn out to be inaccurate. Several outstanding corporate loans should instead be considered project loans, and are accordingly reclassified as such later, by the supervisory authority. Due to the reclassification mentioned above, the analyses published by the supervisory authority differ in part from public statistics, which is also evident in the discrepancies in risk statistics released at a later date (Szenes et al., 2017). As a result, the true project finance volumes and

Figure 3

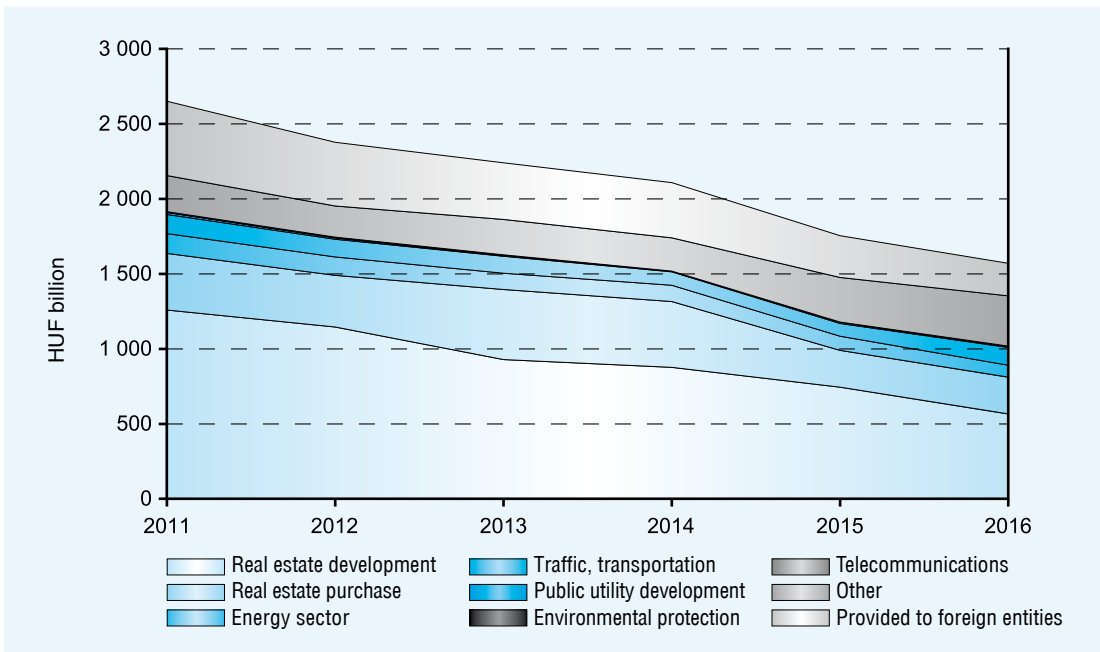
THE GROSS VALUE OF CORPORATE LOANS, INCLUDING PROJECT LOANS, IN HUNGARY



Source: National Bank of Hungary (2017)

Figure 4

PROJECT LOANS IN HUNGARY BY SECTOR (GROSS VALUE)



Source: National Bank of Hungary (2017)

their proportion in the total volume of corporate bank loans probably exceed even the aforementioned statistics, and play an even more dominant role.

RISK STATISTICS AND CHARACTERISTICS OF PROJECT FINANCE IN THE GLOBAL MARKET AND IN HUNGARY

The most comprehensive global empirical analysis of the risks of project finance is the one performed by Moody's (2013), including an evaluation of over 4000 projects from the period between 1983 and 2011. While truly extensive, the database underestimates the market as a whole. Again, it is worth noting that the database includes only large projects and their related loans. Smaller project loans, which are not registered on the secondary market, can differ in both their risk statistics and their characteristics. Nonetheless, the study calculated a wealth of interesting and important figures relevant to the risk profiles of large projects, and drew several conclusions regarding default rates and recovery statistics. Our own assessment of the Hungarian market below is also based on the conclusions of said study.

One feature of note is that the average default rate and default risk of projects corresponds to loans somewhere between the end of the investment category and the beginning of the speculative category. This feature also bears importance from another point of view. For normal corporate loans, the investment category (with the corresponding rating value calculated according to external and internal systems) is a vital dividing line, determining whether or not a corporate loan can still be approved via normal procedures. On the other hand, the annual changes and dynamics of default rates are uneven. Based on Moody's analysis (2013), the cumulative default rate for the

10-year-long period was around 9–10 percent, but threshold rates in the first 3–4 years were significantly higher (1.5–1.9 percent). After the 4th or 5th year, the rates gradually dropped below 1 percent. This fact throws light on the double risk profile of project finance, as well as the different characters of execution/performance risk and operational/market risk. The realisation of the project involves others risks as well (e.g. cost overrun, the quality of execution), which would require a separate assessment. Banks usually do conduct this from a qualitative point of view, however, the project default assessments tend to be applied to the whole period as a whole, largely focusing on the operational part and cash flow production. By contrast, the data clearly show that the overall and the default risk of a project can significantly decrease once the project "survives" the 1–2-year-long construction/realisation phase, and an additional 1 or 2 years after implementation begins. This phenomenon is further confirmed by another important risk indicator, according to which the average time to default for all projects is 3–3.5 years, which can be considered to be surprisingly short. This is the reason for projects often being refinanced after the realisation phase, which is when older, more expensive loans are replaced by more affordable ones.

When compared with corporate loans, it is evident that, with regards to annual dynamics, the annual default statistics of less risky corporate loans do not show any significant change. This shows a marked deviation from the risk profiles of project finance. On the other hand, the risk profiles of riskier, more speculative corporate loans show a much greater similarity to project risk profiles. The *marginal default* rates grow for 4–5 years, then start decreasing. The aforementioned phenomenon supports the generally held observation in risk management that the first 3–4 years are when it becomes evident how viable a riskier

investment loan or a riskier company is, and how good the lending decision proved to be. The bank is capable of assessing risks for the first year, but it is the following few years that represent the true bulk of the risk. Somewhat like for projects, should the company ‘survive’ those years, the risks start decreasing significantly. Neither is it surprising that the number of defaults shows a strong correlation with financial crises. As the analysis published by Moody’s clearly shows, the number of failed projects increased significantly between 2002 and 2003, as well as between 2009 and 2010. However, these numbers swiftly returned to normal levels.

Before analysing the Hungarian market, two important general research issues arise. On the one hand, it would be important to examine whether the change in project pricing was in line with risks in this fiercely competitive market, whether the terms and conditions of the loans were proportionate to the risks, and whether they actually generated added value for the bank. Another similar aspect of analysis was whether the fall in prices often experienced after the execution phase during the usual course of refinancing was in fact proportionate to the decrease in risk.⁴

When analysing the Hungarian market, the regional classification of global analyses considers Eastern Europe to be separate from Western Europe. Naturally, Hungary is regarded as part of Eastern Europe. An average default rate (4.9 percent) is calculated for the region. However, this is a very general, average value including projects of various terms, and can therefore only serve as a rough guide. Based on the aforementioned average default rate, the average risk of the region is only slightly higher than the Western European rate, and significantly lower than the American or the Southeast Asian rate.

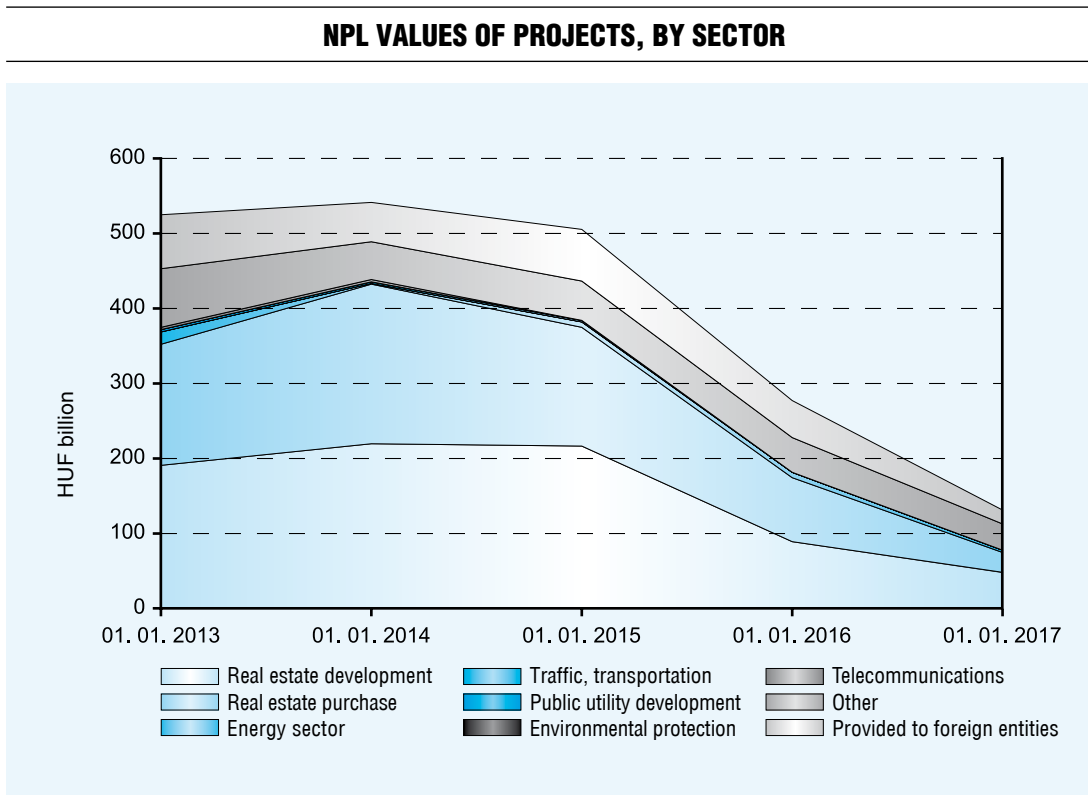
There are only a few Hungarian studies directly investigating risk in the Hungarian

market. In addition to general lending practice, *Kalfmann* (2010) also researched changes in project finance risk management due to the impact of the crisis. His analysis of the banking market describes the marked change in project finance risk management during the crisis, and notes that this was the area where commercial banks decreased their activity the most. The credit scoring process also grew stricter, as did the terms and conditions for loans (security, own funds). Within the energy industry, *Madácsi* (2015) gives a detailed analysis of gas engine projects in detail before and after the crisis and regulatory changes, demonstrating how the crisis and price control slowed down the market and considerably damaged project solvency. The article written by *Szenes et al.* (2017) also includes the latest risk statistics. The study analyses the risks and returns of real estate projects, focusing on the market as a whole, as well as using the portfolios of some large banks individually, as a kind of model.

The following calculations and conclusions are based on the available supervisory data (National Bank of Hungary, 2017). Before comparing our own calculations with those of international research, it should be noted that Hungarian market data apply mainly to smaller projects, as opposed to the analyses of large, internationally syndicated projects based on the Thomson Reuters database, as outlined above. The available supervisory data are suitable for following the changes of project finance in the Hungarian market, changing NPL rates, and impairment losses in portfolios since 2013. The Hungarian figures can then be compared, in part, with international performance data.

One significant aspect of risk concerns non-performing loans (NPL). The NPL values and rates of sectorial project portfolios are shown in *Figure 5*. The default NPL portfolio refers to a portfolio with 90-day delay in payment.

Figure 5



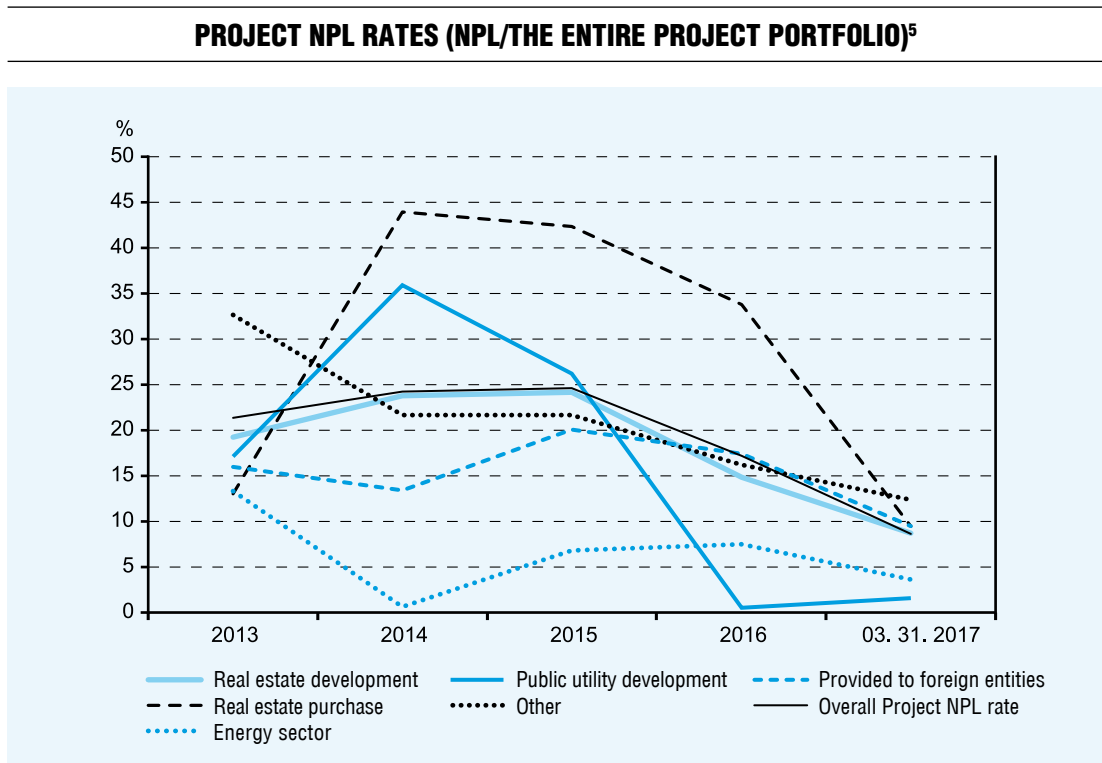
Source: National Bank of Hungary (2017)

Post-crisis, in 2013–2014, based on public data, the value of portfolios with over 90 days of delay in payment was about HUF 500 billion, which gradually decreased to HUF 130 billion by the end of 2017. When comparing this figure with the entire portfolio, the average NPL rate was very high, approximately 20–25 percent, which proceeded to enter a steep decline to below 10 percent by 2017. Similarly to the portfolio volume, the most dominant portfolio for NPL values is also related to real estates, more specifically to real estate development, which constitutes 2/3 to 3/4 of the total NPL stock. (See Figure 6)

As the total amount of corporate loans (including projects) and special credit exposures have been separate entries in the database since 2013, we were able to distinguish between project loans and wholly corporate

(non-project) loans when examining the change in the average NPL rate. (See Figure 7) Based on the first set of data, in 2013, the NPL rate of wholly corporate loans was about 13 percent, while the rate of project loans was over 21 percent. Together, their average rate came to 16.4 percent. After 2013, the quality of the wholly corporate portfolio improved drastically. Between 2015 and 2017, its rate fluctuated between 1.5–3.5 percent, while the NPL rate of project loans further increased to 25 percent, then later dropped back down to 9 percent. The pre-2013 data were not fully available, and therefore could not be included in our calculations. However, it seems reasonable to assume that the risk indicators of project loans were previously still worse than those of wholly corporate loans, which gave us our average corporate NPL data series. The

Figure 6



Source: National Bank of Hungary (2017)

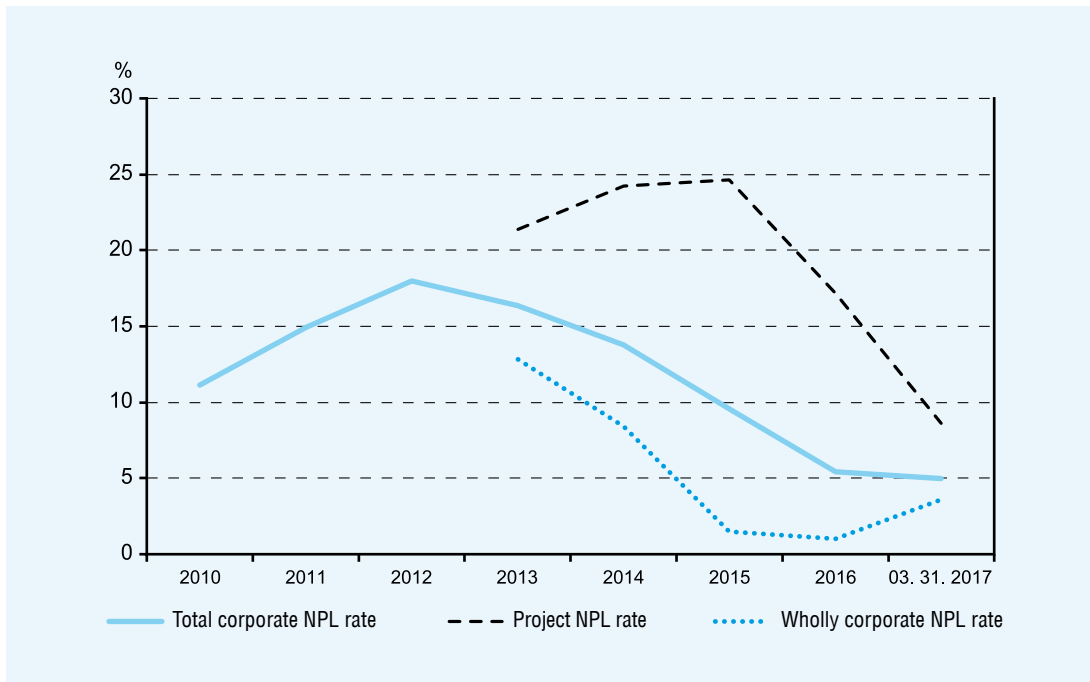
excessively high NPL rate of projects, which the banks could presumably see in their own individual portfolios, provides compelling evidence for the general experiences and observations of Kalfmann (2012), explaining why this area experienced a general credit squeeze, and why banks consequently curtailed their project finance activities. Although the banks were obviously familiar with their own portfolios, up to 2013, only overall corporate NPL rates could be calculated. As a result, those were the statistics included in international risk analyses, despite being exceptionally poor even on a regional level. When analysing the data retrospectively and considering the wide gap between the NPL figures of the two sectors (corporate vs. project), I believe that the fact above certainly had a negative influence on the international, general and corporate risk assessment of the country, and contrib-

uted to the decrease of general lending activity in the banking sector. In the future, it would be highly important to calculate and publish NPL statistics in the two segments separately. I believe that this, in itself, would do much to provide a more accurate picture, and improve the general opinion of the Hungarian corporate loan market. This would be especially important in a market that continues to be dominated by foreign banks.

As international research also shows, Hungarian corporate and project risk indicators have shows significant deterioration in the years of the crisis. What appears to be different, however, is that the negative effect of the crisis on the Hungarian market lasted a very long time, as opposed to the increase in failed projects on the international market, which only showed a significant increase in 2009 and 2010. In Hungary, the NPL

Figure 7

CHANGES IN WHOLLY CORPORATE AND PROJECT NPL RATES



Source: National Bank of Hungary (2017)

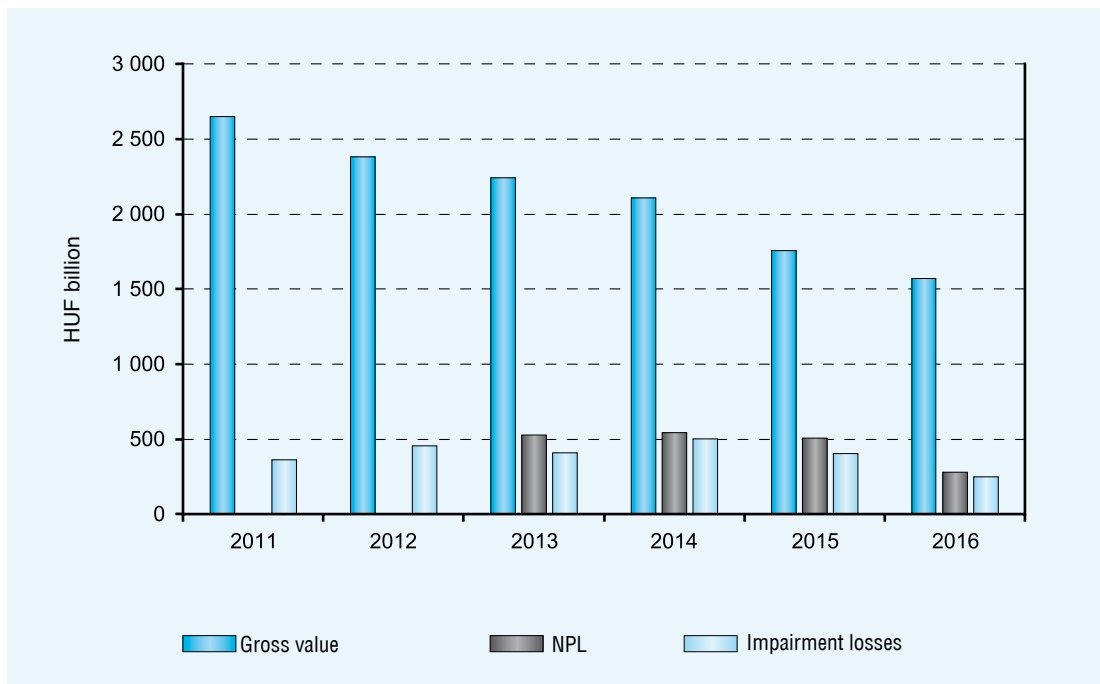
stock of projects continued to increase even through 2015, which means that the number of failed projects per year did not start decreasing significantly, and/or the clearing of the NPL stock (and the process of recovery) happened very slowly. The latter statement is supported by the fact that a significant part of the projects are related to real estate development, the volume of which was over USD 1000 billion in 2013–2014. In contrast with the decrease in the NPL value of projects in all segments since 2013, the NPL value of real estate development projects was still increasing in 2014, and real improvement was only evident starting in 2016, which was probably related to the recovery of the real estate market as a whole.⁶

Based on the data, the change in non-performing portfolios was proportionate to the incurred impairment losses. Although the

impairment loss and NPL stock data from the first years of the crisis are unknown, *Figure 8* indicates that impairment losses and NPL stock reached their peak around 2014, which, again, implies a long-lasting impact of the crisis on Hungarian projects. Moreover, the NPL stock and the value of impairment losses were very close to each other (in the years for which both figures are available). The data above still do not reveal much about the actual recovery rates, but they do imply that for problematic loans, when creating a special reserve, the loss expected by the banks was close to the total value of the non-performing portfolio. In the light of the above, the banks have been rather conservative with loss and recovery forecasts from 2013 on.

Nonetheless, it would be important to know the recovery statistics of Hungarian projects. Unfortunately, the data above do not

GROSS PROJECT VALUE AND IMPAIRMENT LOSSES, NPL STOCK



Source: National Bank of Hungary (2017)

reveal whether the drop in NPL stock was due to the write-off of losses or to recovery, making it unsuitable for determining recovery statistics. On the other hand, international performance data for larger projects is available (Moody's, 2013). Internationally, the average recovery rate achieved by restructuring is about 80 percent, and 45–50 percent for asset sales. International recovery values also show that the risks for the execution and operational periods are completely different. For projects going bankrupt during the construction period, the average recovery rate is approximately 60 percent, while in the operational phase, it exceeds 80 percent. It is important to assess whether the recovery is in line with the changes in default rate through time. Here, we find differences between the findings of international and Hungarian research. On the one hand, the analysis published by Moody's

shows that there is no correlation between the default rate and the recovery rate. On the other hand, research based on Hungarian supervisory experience claims the opposite (Szenes et al. 2017). According to the latter study, in times of crisis, with more project defaults, the market of assets serving as securities, generally real estate, is also in crisis. As a result, the market value of real estate decreases, which has a negative effect on recovery.

From a Hungarian point of view, the international analysis has another relevant and interesting finding relevant to PPP projects. When looking at the volume of PPP projects, Hungary continues to remain in the middle of the European rankings. On the other hand, the total loans outstanding equal 2 percent of its GDP, which is one of the highest such ratios in all of Europe. (Tomasi, 2016) Despite the fact that no new PPP projects have been realised

for years, these projects used to have a maturity time of over 20 years, and are therefore expected to be present in project portfolios for a long time. In a global context, PPP default statistics indicate that the risks of PPP projects are even lower than the risks of infrastructure projects (the average annual default rates are between 2–3 percent, as opposed to 3–4 percent), and are considerably lower than the general project risk (Moody's, 2013, p. 24).

CONCLUSIONS

Project finance has increased enormously in volume over the past two decades, and therefore plays a key role in general corporate lending and banking portfolios. During the crisis, this growth came to a halt, but has then continued over recent years. Project finance differs from normal corporate lending in a number of aspects, which is something banks and regulatory bodies are aware of, and as a result, many models and publications have dealt with the management, assessment and modelling of the associated risks. Risk management and default prediction based on own models principally use structured models and cash flow simulation.

A number of conclusions can be drawn from the risk profile of project finance. Based on international experiences, a project finance tends to fall somewhere between a corporate loan that only just fulfils the requirements of the investment category, and speculative loans. As far as risks are concerned, there is a sharp distinction to be drawn between execution risk and operational risk. The aforementioned difference is clearly visible in the time to default values of default and return statistics. If a project makes it through the construction period and begins implementation, the likelihood of default significantly decreases. Even if default does occur, the chance of recovery is much

higher. At the same time, the structured models described above usually do not emphasise this, nor do they distinguish between execution risk and post-implementation operational or business risk. The project is considered as a single unit, even though such distinctions would be essential for a more accurate risk assessment. In my view, the current cash flow simulation systems are mostly only suitable for risk assessment in the operational phase. When assessing the risks of the execution phase, the risks of unexpected, one-time events (e.g. fraud, accidents, environmental issues, obstacles to engineering, execution quality) should be given far more attention. The analysis of the two phases requires two different methodologies. To the best of my knowledge, banks are not currently doing so in any systematic fashion. The statement above needs to be supported by further research, which would use empirical data to compare the reasons for default occurring in the two phases, as well as the different risk profiles involved.

The higher risk involved in project finance has been confirmed by Hungarian data, as well. Over the past decade, project finance has comprised a large proportion of domestic portfolios, with real estate finance being especially dominant. Having been negatively affected by the financial crisis, default statistics show a much more unfavourable picture when compared with normal corporate loans. This has also severely damaged the average default statistics. Another problem is that the return period may last for several years, "poisoning" portfolios in the long run. The Hungarian and international markets show different correlations between recovery efficiency after project defaults and the occurrence of defaults. This phenomenon, as well as recovery efficiency itself, would be an important subject for further analysis and research, while clearly delineating the execution and the operational phases.

Based on international volume data and

Hungarian market news, the dominance of real estate finance is expected to continue in the portfolios of Hungarian banks. It would be worthwhile to test the hypothesis whether default statistics for Hungarian real estate projects are also significantly worse than the statistics for the operational phase. The real estate projects of recent years could serve as a rich database for analysis.

Finally, examining risk statistics, it would be important to establish a risk adjusted pricing

system for project loans. The establishment and continuous control of such a clear and transparent system, using certified calculations, would prevent the accumulation of high levels of possibly underpriced project risk. This is especially vital due to the fact that, due to significant real estate and infrastructural investments, project finance is expected to continue increasing in Hungary in the following years. Setting up the system described above would help in avoiding past mistakes.

NOTES

¹ The expected loss (EL) equals the probability of default (PD) multiplied by the expected loss of default for the given project.

² The database used is one that almost all international analysis is based on: the Thomson Reuters statistics.

³ According to Yescombe (2013, pp. 10–11), the total project finance volume for 2012 is estimated to be around USD 300 billion, as opposed to the USD 200 billion value listed in the statistics above.

⁴ The first findings in this field of research were detailed by Walter (2017).

⁵ Specified on the basis of the data from March of the year concerned, with detailed data available on 90-day lapses. The figure does not include some sectors with

insignificant volume, therefore the NPL data cannot be considered relevant to the overall picture (transportation, environmental protection, telecommunications). The data do not include the portfolios of banks operating as branches in Hungary, which represent a value of no more than HUF 15–20 billion. For such banks, loan defaults would be essentially zero.

⁶ These calculations are somewhat contrary to the calculations published by Szenes et al. (2017). However, the estimations published by Szenes et al. for the 2005–2014 period relied not purely on public data, but also on supervisory data based on investigations conducted at banks. The actual project database in their analysis (complemented by loans which banks considered to be corporate but were in fact not) and the official statistics of actual default portfolios may differ from our own analysis.

REFERENCES

ANASTASIOS, K. (2015): Confessions of a Project Finance Modeler. *Journal of Structured Finance*. Summer, Vol. 21, Issue 2, pp. 74–75

BLACK, F. – COX, J. C. (1976): Valuing Corporate Securities: Some Effects of Bond Indenture Provisions. *Journal of Finance*, Vol. 31, No. 2, pp. 351–367

CHIARA, N. – GARVIN, M. J. (2008): Variance models for project financial risk analysis with applications to greenfield BOT highway projects. *Construction Management and Economics*, September, 26, pp. 925–939

CSISZÁRIK-KOCSIR Á. (2016): Transformation of the International and European Project Finance Market as

a Result of the Crisis. *Financial and Economic Review*, Vol. 15. Issue 1, pp. 51–69 March

DELLA CROCE, R. – GATTI, S. (2014): Financing infrastructure – International trends. OECD Journal: *Financial Market Trends* Volume 1

DIKMEN, I. – BIRGONUL, M. T. (2006): An analytic hierarchy process based model for risk and opportunity assessment of international construction projects *Canadian Journal of Civil Engineering*, January 1

DONG, F. – CHIARA, N. – KOKKAEW, N. – XU, A. (2012): Copula-Based Portfolio Credit Risk Assessment in Infrastructure Project Finance. *The Journal of Private Equity*, Spring

ESTY, B. C. (2004): Why Study Large Projects? An Introduction to Research on Project Finance. *European Financial Management*, Vol. 10, No. 2, pp. 213–224

GATTI, S. – RIGAMONTI, A. – SENATI, M. – SAITA, F. (2007): Measuring Value-at-Risk in Project: Finance Transactions. *European Financial Management*, Vol. 13, No. 1, pp. 135–158

GATTI, S. (2012): *Project Finance in Theory and Practice*, II Edition, Academic Press, San Diego

HALDANE, A. G. (2012): Control Rights (and Wrongs): *Economic Affairs*, June

HORVÁTH S.A. – KOLTAI J. – NÁDASDY B. (2011): *Strukturált finanszírozás Magyarországon (Structured Financing in Hungary)*, Alinea, Budapest

KALFMANN, P. (2010): Changes in Risk Management Practices after the Crisis: the Hungarian Perspective. *Financial and Economic Review*, Vol. 9, Issue 4, pp. 309–320

MADÁCSI R. (2015) *A projektfinanszírozás alakulása a hazai energetikai szektorban. A KÁT-rendszer hatása a hazai kiserőmű-beruházásokra (Changes in project fi-*

nance in the Hungarian energy sector. The effect of the KÁT system on domestic small-scale power plant investments). *Gazdaság és Pénzügy (Economy and Finance)*, 2 (3). pp. 206–222

MADÁCSI R. – WALTER, Gy. (2016): Projektfinanszírozás. *Vállalatfinanszírozás a gyakorlatban (Project finance. Corporate Financing in Practice)*, Alinea Kiadó, Budapest, pp. 114–132

MERTON, R. C. (1974): On the Pricing of Corporate Debt: The Risk Structure of Interest Rates. *Journal of Finance*, Vol. 29, No. 2, pp. 449–470

NEVITT, P. K. – FABOZZI, F. J. (2000): *Project Finance*, 7th Edition, Euromoney Books

RAVIS, J. G. (2013): Risk Analysis Paramount in Project Finance Decisions. *Natural Gas & Electricity*. Nov, Vol. 30, Issue 4, p1–7. pp. 6

SZENES M. – TOMSICS A. – KUTASI D. (2017): A kereskedelmi ingatlanfinanszírozás kockázatai a felügyeleti felülvizsgálatok tapasztalatai alapján. (*The Risks of Commercial Real Estate Finance Based on Supervisory Reviews) Hitelintézet Szemle (Credit Institution Review)*, Vol. 16, Issue 1, March, pp. 74–91

TOMASI, M. (2016): Public Private Partnerships in Member States. DG ECFIN Unit B.4 „Impact of EU policies on national economies” 10th meeting of public finance economists. Presentation, Brussels, 02/03/2016, downloaded on 01/08/2017

TRIOLE, J. (2006): *Theory of corporate finance*. Princeton University Press

WALTER Gy. (2016): *Kereskedelmi banki ismeretek (On Commercial Banking)*. Alinea Kiadó, Budapest

WALTER, Gy. (2017): Are Project Loan Prices Properly Risk Adjusted? Annual Financial Market Liquidity Conference, November 16–17

YESCOMBE, E. R. (2013): *Principles of Project Finance*. Academic Press

CRR – Capital Requirement Regulation – REGULATION (EU) No 575/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL. of 26 June 2013. on prudential requirements for credit institutions and investment firms and amending Regulation (EU) No 648/2012

EBA (2016): EBA/RTS/2016/02, 13 June 2016 FINAL draft Regulatory Technical Standards on Assigning Risk Weights to Specialised Lending Exposures

under Article 153(9) of Regulation (EU) No 575/2013 (Capital Requirements Regulation – CRR)

Moody's (2013): Default and Recovery Rates for Project Finance Bank Loans, 1983–2011. Moody's Investors Service. Feb. 4

National Bank of Hungary (2017): <https://www.mnb.hu/felugyelet/idosorok/i-penz-es-hitelpiaci-szevvezetek> Online. (Accessed: 28/06/2017)

Standard and Poor's (2001): Project Finance Summary Debt Rating Criteria, Standard and Poor's (2001)