

Methodological issues of credit rating – Are sovereign credit rating actions reconstructible?*

Imre Ligeti – Zsolt Szórfi

Credit rating agencies formulate publicly available opinions on the capacity and willingness of debtors to repay debts. By doing so, they reduce the information asymmetry between creditors and borrowers. Owing to regulatory efforts commenced in recent years, credit rating processes have become increasingly more transparent as credit rating agencies publish their methodology and make available the values calculated for the most important key variables. This study is intended to examine the extent to which the indicative rating range resulting from the methodology at the current level of transparency explains the empirically observed credit rating of sovereigns. The authors calculated a rating range of three notches and found that in the case of S&P, a higher ratio of observed credit ratings fell within this range and allowed for the reconstruction of individual steps, while Moody's and Fitch's currently available methodologies proved to be less suited for such a reconstruction.

Journal of Economic Literature (JEL) Classification: G14, G24

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1. The role of credit rating agencies in sovereign risk assessment

1.1. Key functions of credit rating agencies in financial markets

In performing their core activity, credit rating agencies formulate publicly available opinions on the capacity and willingness of the reviewed entities to repay debt. They do so by condensing available public and non-public information into indicators which can be easily interpreted by market participants. According to their primary role in financial markets, credit rating agencies attempt to eliminate the information asymmetry between the two sides of the debt, which benefits borrowers and creditors alike. The borrower sends to a broad range of market players a sign of its creditworthiness, ascertained through an independent assessment recognised as credible by the market, while investors can obtain the same information at minimal

* The views expressed in this paper are those of the author(s) and do not necessarily reflect the official view of the Magyar Nemzeti Bank.

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cost. As a result of the intermediation of credit rating agencies, it is easier and cheaper for borrowers to gain access to funding from the capital market, while creditors can form an informed view on the credit risk before making an investment (*Fennel and Medvedev 2011*).

In addition to their role as information providers, acting as an agent of the investor, credit rating agencies also undertake a monitoring function. By issuing warnings of potential downgrades (e.g. negative outlook, watch list), they can encourage the borrower to take corrective steps. The third key function of credit rating agencies is the issuing of certificates, as rating categories have become organic parts of countless regulatory requirements and financial contracts in recent decades. Rules on rating-dependent capital requirements, central bank collateral requirements or benchmark indices constructed on the basis of various credit ratings are only a few of the numerous examples. Indeed, some of the regulatory efforts of recent years have been aimed at the removal of excessive reliance of financial contracts and regulations on credit rating actions in order to reduce the potential negative spillover effects of rating actions (*Kiff et al. 2012*).

The primary users of credit ratings are market participants without the means to establish the creditworthiness of the borrower. In addition, there is greater reliance on credit ratings in cases where non-public information represents a relatively significant part of the inputs manifested in the credit rating of the given entity. Moreover, in consideration of regulatory capital requirements, banks are consistent users of credit ratings and, in general, larger market participants also use rating agency evaluations as supplementary information or as a benchmark for comparing against results obtained by their own internal rating systems (*Mattarocci 2014*).

1.2. Business model and market structure of credit rating agencies

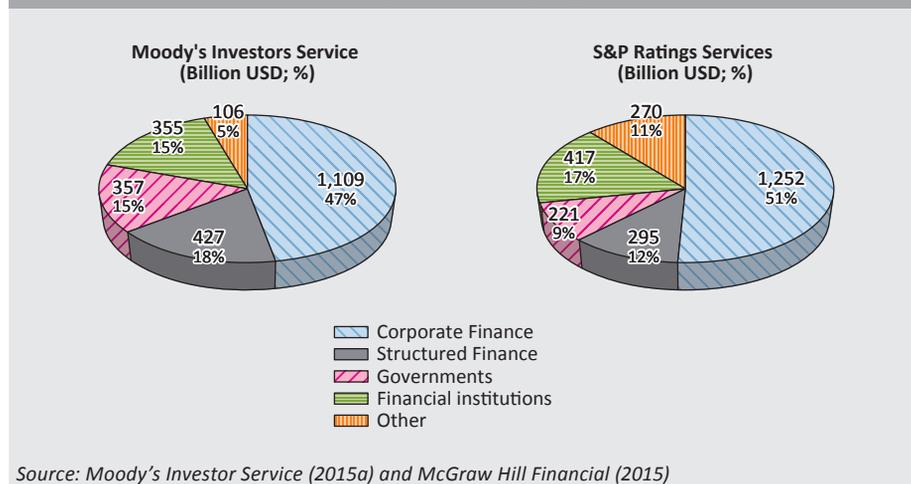
The origins of the ratings agency industry go back to the period between the second half of the 19th century and the beginning of the 20th century with the increasingly strong presence of the corporate sector of the United States in the capital market. However, as opposed to the United States as a sovereign issuer, investors faced significant risks with respect to corporations, which created a need for reliable, professional credit risk assessments. Initially, the market grew slowly. The real breakthrough arrived in 1975 with the adoption of the Securities and Exchange Commission's (SEC) regulation, which adjusted the level of capital requirements applicable to instruments held by brokers/dealers to the credit rating of the given instrument. Subsequently, the development of the market was given a further boost, as an increasing number of regulations began to cite the ratings of credit rating agencies (*Mattarocci 2014*).

Dominated by the three leading agencies (Fitch, Moody's, S&P), the current market structure is highly concentrated. These three market leaders issue around 60 per

cent of the ratings available, while about 73 per cent of the rated issuers have at least one rating from the three leading agencies. Although the appearance of smaller rating agencies has somewhat reduced the concentration¹ in the last decade, the dominance of the three market leaders is still unquestionable. This can be mainly attributed to the high fixed costs of market entry, stemming from the fact that the acquisition of reputation is a time-consuming process, and agencies with more than a hundred years of history naturally enjoy an advantage in this regard. Although the high degree of concentration does not point to the existence of a competitive market, the desire to preserve reputation creates an incentive for existing raters to increase the quality of the service they provide continuously (Mattarocci 2014).

The primary source of income of credit rating agencies derives from their core activity, the rating of issuers and the securities issued. This is supplemented by ancillary activities associated with the core activity, such as the provision of analysis services, risk management models, and information technology solutions. Ancillary services are typically separated from main services even in the organisational structure of the institutions; for example, in the case of Moody's, credit ratings are provided by Moody's Investors Service, while Moody's Analytics is responsible for ancillary services. The revenues of the latter amounted to around USD 1 billion in 2014, while revenues from credit ratings exceeded USD 2.3 billion. The breakdown of rated issuers and securities by segment indicate that non-financial

Figure 1.
2014 revenue breakdown of Moody's and S&P by segment



¹In a global sense, less prominent credit rating agencies have appeared at the regional level. Noteworthy institutions include the European Rating Agency in Europe, the Japan Credit Rating Agency in Japan and the Dagong Global Credit Rating Agency in China.

institutions account for nearly half of the revenue, with the rest distributed nearly equally between financial institutions, the rating of structured finance products and the government sector (*Moody's Investor Service 2015a*). The latter includes sovereigns and the rating of the securities issued by them, as well as the rating of local government bonds and securities issued by other public institutions. The revenue structure of the other two major credit rating agencies corresponds to that of Moody's in magnitude (*McGraw Hill Financial 2015; Fimalac 2015*).

As regards pricing policy, two main types can be distinguished. In the case of the "user fee" approach, the rating agencies obtain their fees from the users, while the issuers themselves pay for the credit rating under the "issuer fee" model. Since the information reflected in the credit rating is for the public good, it is difficult to prevent market participants from using the service free of charge. In order to exclude free riders from the service, the business model of credit rating agencies is typically based on the "issuer fee" approach (*Fennel and Medvedev 2011*).

In an attempt to resolve the conflict of interest between the objectivity of credit rating and customers' need for the best possible rating, credit rating agencies responded (partly as a result of regulatory provisions and partly on their own initiative) by setting up internal information firewalls and by adopting a code of conduct. On the one hand, the organisational unit responsible for the analysis preceding the credit rating review and the rating committee responsible for the rating action are separated from each other within the organisation; on the other hand, in operative processes, firewalls are set up between marketing areas (including the pricing of the service) and the credit rating activity itself (*Mattarocci 2014*).

1.3. Regulation of the sector

The need for crafting regulations for the industry dates back to the pre-crisis period: the US Congress enacted regulation aimed at the reform of credit rating agencies in 2006.² Its objective was to improve ratings quality by fostering accountability, transparency and competition in the credit rating agency industry. The Act defined the requirements that all SEC-registered credit rating agencies were expected to meet and bestowed statutory authority on the SEC to oversee the credit rating industry with respect to internal controls and conflicts of interest. With a view to increasing transparency, the Act required credit rating agencies to disclose their credit rating methodologies and performance measurement statistics. Adopted in 2010, the Dodd-Frank Act³ strengthened the regulatory and supervisory powers of the SEC and imposed further requirements on credit rating agencies (*IMF 2010*). In addition to increasing methodological transparency and tightening internal controls,

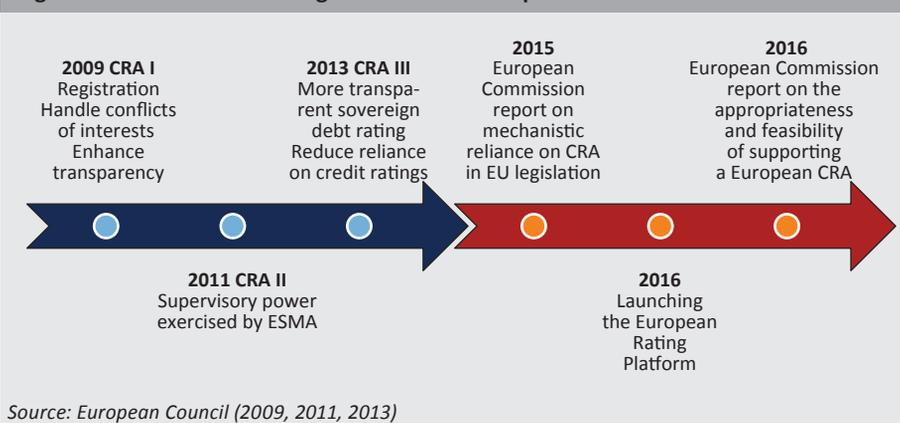
² Credit Rating Agency Reform Act of 2006

³ Dodd-Frank Wall Street Reform and Consumer Protection Act

the flagship initiative of the Act was to require all federal agencies to review their credit risk regulations in order to remove, wherever possible, references to or reliance on credit ratings and substitute them with an alternative standard of creditworthiness (*Biedermann and Orosz 2015*).

In the European Union, regulation of the sector began with the extension of the regulation of financial markets and products at the G20 summit of 2008. The legislation adopted in 2009 and its subsequent amendment (CRA I–II Regulation) after the establishment of the European Securities and Markets Authority (ESMA) – the body responsible for the registration and supervision of credit rating agencies – declared the requirements for obtaining credit rating agency status (essentially similar to the US practice) and regulated conflict of interest issues arising during the performance of credit rating activity (*European Council 2009; 2011*). The third amendment of the legislation (CRA III) in 2013 clarified and tightened certain already regulated issues and defined the reduction of over-reliance on credit ratings as a general guideline. Accordingly, it encouraged supervisory authorities and financial market participants to put internal procedures in order to make their own credit risk assessment (*Bábosik 2014*) and prohibited the European Systemic Risk Board from using direct references to the ratings provided by credit rating agencies. The goal was to avoid entrance into financial contracts where parties rely on credit ratings provided by an external agency as the only parameter to assess the creditworthiness of an entity.

Figure 2.
Regulation of the credit rating sector in the European Union



However, with respect to sovereign credit rating, the new elements included in the amendment primarily affected transparency. Under CRA III, credit rating agencies are required to review sovereign ratings every six months and schedule their announcements on the basis of a pre-defined calendar in such a manner that the

rating decision is announced on a Friday one hour after the close of the business hours of EU -regulated markets and at least one hour before their next opening. Credit rating agencies are required to justify any deviation from this procedure. The biannual review does not necessarily need to be followed by a credit rating action; this requirement is only applicable to the frequency of internal assessment. Moreover, in order to facilitate users' understanding, the credit rating decision must be explained by disclosing the factors and underlying assumptions that may have had an impact on the decision (*European Council 2013*).

The new regulation also offers guidelines in relation to future steps. After the establishment of the European Rating Platform in 2016, users will have access to up-to-date rating information on a central website under the business models of all registered credit rating agencies. In addition, the European Commission is to prepare a report by the end of 2016 regarding the feasibility of an EU-wide sovereign credit rating agency. In the spirit of reducing over-reliance on credit ratings, by the end of 2015 the Commission will examine the extent to which EU-level regulations include references which may trigger mechanistic reliance on credit ratings and identify possible alternatives for their replacement. In part, this is related to the implementation of the aforementioned uniform, community-level rating system. The regulation aims to phase out all references to credit ratings in European Union law for regulatory purposes by 2020, provided that appropriate alternatives have been identified and implemented (*European Council 2013*). Minimising mechanistic reliance on credit ratings would not lead to the obliteration of the sector. On the one hand, this is a slow process; on the other hand, market participants continue to demand the services of credit rating agencies, as, lacking adequate capacity, some participants will still rely on the professional expertise of credit rating agencies in assessing the credit risk associated with a borrower.

2. Methodology of sovereign credit rating

2.1. General features of the methodology

In rating sovereign issuers, credit rating agencies assess the sovereign issuer's capacity and willingness to meet its debt obligations to private entities upon maturity. As such, the assessment does not affect liabilities toward authorities (IMF, Paris Club, World Bank, etc.). At the same time, refusal to honour obligations toward an authority can signal a sovereign's questionable willingness to pay, which may worsen the rating of the given sovereign. Credit rating agencies rank the relative default⁴ risk on an ordinal scale of 21–22 notches,⁵ where the bonds issued by

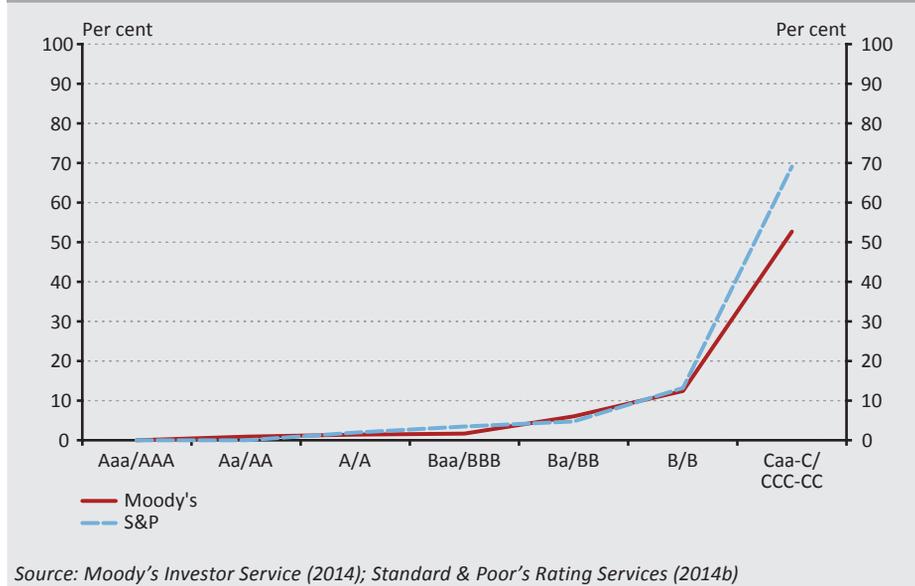
⁴ Due to the fluctuation of business cycles, measuring absolute default risk would force the agencies to adjust credit ratings on a continuous basis.

⁵ The scale from 1 to 20–21 refers to the rating of the issuer's long-term foreign currency debt. For short-term foreign currency debt, credit rating agencies typically apply a shorter scale with fewer notches.

sovereigns classified in the same category represent nearly identical credit risk. The ordinal nature of the scale suggests that it is the sequence of the credit risks associated with adjacent rating categories that is of primary concern; the difference between them is not permanent. Empirical evidence shows that countries with a lower credit rating tend to be associated with proportionately higher credit risk, compared to countries with better ratings.

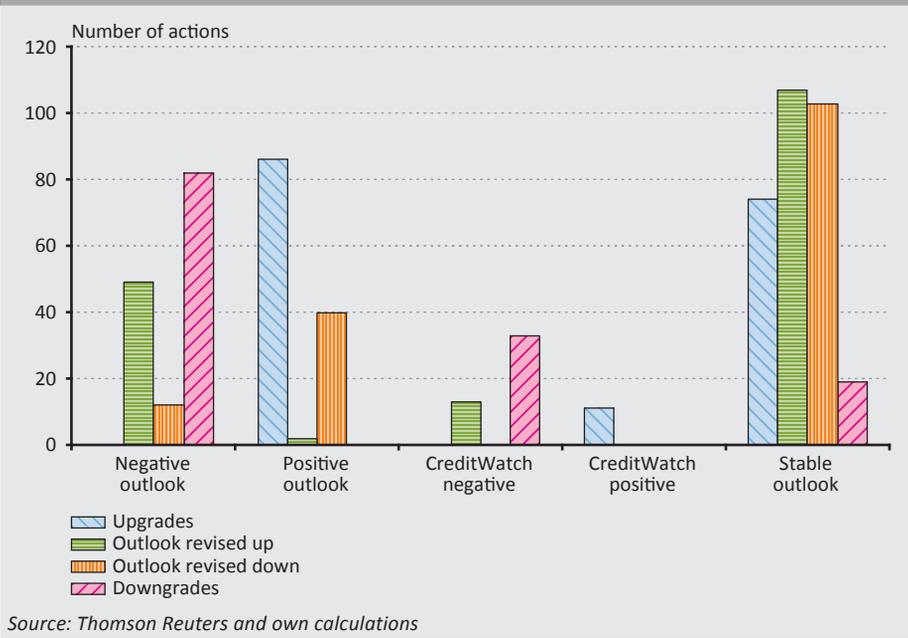
Figure 3.

Average cumulative default rates on a 5-year horizon by initial rating category by Moody's (1983–2013) and by S&P (1975–2013)



The probability of modifying the current rating is indicated by the (negative, stable, positive) outlook and the watchlist (review) categories, which are also used to fine-tune the discrete scale. By definition, a stable outlook means that the rating of the given sovereign is not expected to change over the medium term (i.e. typically within the next 0.5–2 years). In the case of Moody's, after the initial assignment of a stable outlook, about 90 per cent of ratings experience no change during the following year (*Moody's Investor Service 2015b*). According to empirical evidence, an initial positive or negative outlook is followed by a corresponding decision in nearly two thirds of the cases. However, in the case of a positive outlook, the relative probability of an upgrade (in comparison to cases other than an upgrade) is higher than the relative probability of a downgrade following the assignment of a negative outlook, which confirms the presence of credit rating agencies' monitoring function. Therefore, in the case of a negative outlook, sovereigns strive to avoid a potential downgrade.

Figure 4.
Distribution of credit rating actions in light of Fitch’s rating outlook prior to the rating action



In addition to rating sovereigns as issuers, credit rating agencies also rate the securities issued by the sovereigns. Given that these securities generally represent senior, unsecured debt, they typically receive the same rating as the sovereign itself. Moreover, the rating of both sovereign and issued securities may differ according to their currency denomination (i.e. whether the debt is denominated in local or foreign currency). Since sovereigns can meet local currency commitments more easily, local currency debts may be rated a few categories higher than those denominated in foreign currency (for example, in 17 cases out of 128 at the end of 2014 in the case of S&P) (*Standard & Poor’s Rating Services 2015*). In addition, there are separate ratings for short-term and long-term debt, where the foreign currency/ local currency dimensions are equally applicable. In general, the sovereign credit rating of an emerging market sovereign means the credit rating of the sovereign’s long-term, foreign currency-denominated debt. Since the debt of developed countries is typically denominated in local currency, the foreign currency and local currency ratings are identical in their case.

An important difference between corporate and sovereign credit rating methodologies is the inclusion of willingness to repay in the case of sovereigns. Indeed, as opposed to corporations, the repayment of sovereign debt typically

cannot be enforced by way of international courts. In view of high political costs, sovereigns sometimes opt for default, even if capable of repaying the debt. With that in mind, credit rating agencies consider qualitative elements as well, which are primarily captured by the strength of political institutions.

There are usually three basic expectations with respect to credit ratings: they should be accurate predictors of defaults, timely and, as far as possible, stable. However, there is a tradeoff between stability and timeliness, as both conditions cannot be fully met at the same time. When stability is violated (i.e. when ratings change too frequently), market participants may incur unwanted transactions costs as the mechanistic reliance on credit ratings forces them to re-allocate their portfolios far more frequently than would be desirable (*Kiff 2013*).

In order to maintain stability, credit rating agencies apply the TTC (through -the -cycle) approach, which is intended to capture the entire business cycle when determining a sovereign's capacity and willingness to repay debts. This means that agencies typically consider multiannual averages in the case of certain indicators, which are constructed on the basis of historical values on the one hand and on predicted values estimated by the agency on the other hand. This ensures that once the rating is set, it is changed only in response to fundamental factors, without being affected by changes in the business cycle (*IMF 2010*). Credit rating agencies apply their own methodologies to define the magnitude of this smoothing exercise. The difference between the credit ratings of the same entity can be partly attributed to the different assumptions, time horizons and methodologies applied by individual credit rating agencies as they prepare their projections.

Given these methodological considerations and the fact that market participants assign higher weights to cyclical factors, credit ratings show significantly less volatility than other financial market indicators capturing credit risk (e.g. CDS spreads). The more noisy nature of financial market indicators is obviously influenced by a number of other factors. First, to use the example above, in the liquid CDS market information is processed by numerous participants simultaneously. Accordingly, CDS prices respond faster to new information published on the economy of a certain issuer than credit ratings. Secondly, as mentioned above, credit rating actions can only be announced on pre-defined days under the currently effective EU regulation. Finally, like any other market instrument, CDS prices are subject to bias, and the distorting factors may be independent of the credit risk of the sovereign (market liquidity, regulatory changes affecting the given product). Consequently, there may be persisting differences between credit ratings and CDS prices, and due to the factors listed above, the direction of the subsequent alignment of the two indicators is not straightforward.

Pennartz and Snoeij (2012) examined the practice of the three market leader credit rating agencies with respect to the three qualitative dimensions mentioned above: stability, timing and accuracy. They examined the accuracy of sovereign credit ratings with “cumulative accuracy profiles”, the most common method in the literature. This approach approximates the accuracy of each agency by assessing the predictive power of the ratings with respect to default, which is a practical approach, given that a default is the only event where the level of the credit risk is understood with perfect precision. Similarly, the authors analysed timeliness in relation to default, approximating the dimension with two factors: which credit rating agency was the first to downgrade preceding a sovereign default and which agency was the first to issue a default rating. As regards stability, they examined the frequency of rating changes, the frequency of cliff-effects (rating changes of 3 or more notches) and the frequency of rating reversals.

According to the empirical analysis, S&P proved to be the most accurate predictor within a year of default. Over longer time horizons, Moody’s rating accuracy outperformed the other agencies. S&P performed the best in terms of timeliness, although that is partly because S&P was the most aggressive in rating actions during the review period; this may have come at the expense of stability. In other words, S&P was the first to signal the deterioration of an issuer’s credit risk before the default in the short term and was the first to classify the issuer into the worst rating category. This meant, however, that it had to adjust its rating more frequently in the case of sovereigns avoiding default, which in general worsened the stability of its ratings. In terms of stability, Moody’s performed the best; it had the lowest frequency of cliff -effects and reversals and, in general, it changed its ratings less frequently in a year than Fitch or S&P.

Table 1.		
Best scoring agency in each area		
Quality Dimension		Best scoring Agency
Accuracy	Short-term	S&P
	Long-term	Moody's
Timing		S&P
Stability		Moody's
<i>Source: Pennartz and Snoeij (2012:18)</i>		

2.2. Overview of the factors included in the methodological models

Owing to the regulatory efforts commenced in recent years, credit rating agencies have rendered credit rating processes increasingly more transparent. They publish their analytical framework (methodology), and announcements accompanying their credit rating actions provide an increasingly broader view of the criteria assessed and the calculations considered in their decisions. Although – for understandable reasons – the level of this transparency is less than a hundred per cent, the methodological explanations are certainly suitable for allowing a rough reconstruction of the decision process, increasing the ability of users to understand the reasons behind the rating actions.

The methodology can be best described as a scorecard designed to evaluate, depending on the strength of the transparency, the variables on a pre-defined scale which, after the systematic aggregation of the values received, results in an indicative rating range encompassing three notches. According to official methodological notes, actual credit ratings are within the three-notch rating range calculated by the credit rating agencies. At the same time, users are warned that the rating range calculated from the scorecard does not guarantee an accurate final rating; as a matter of fact, in the case of certain countries credit rating agencies maintain ratings outside of the range proposed by the model in practice. The need for this room for manoeuvre can be primarily attributed to the reduced ability of standard models to capture certain country-specific developments; consequently, the use of expert judgement is unavoidable in these areas (*Moody's Investor Service 2013; Standard & Poor's Rating Services 2013*).

Based on the publicly available methodologies, we found that all three credit rating agencies evaluate sovereigns on the basis of 4–5 different dimensions. Typically, the evaluation of each dimension begins with the estimation of an initial score based on the value of certain key variables, and the score arrived at in this way is subsequently adjusted by using additional variables. The rating range proposed by the model is received from the scores of each dimension by using a pre-determined sequence of weighting or a scorecard. Obviously, each credit rating agency applies different variables, different variable computation methodologies, different indicator classifications within and between the individual dimensions, and different time horizons. Nevertheless, the factors examined are essentially the same.

Table 2.
Indicators considered by the three dominant credit rating agencies

Fitch				
Economic assessment	Fiscal assessment	Structural features	External finances	
Real GDP growth Real GDP growth volatility Inflation	Fiscal deficit Public debt Interest payments Public foreign currency debt	Money supply GDP per capita Government effectiveness Status of reserve currency Years since last default	Commodity dependence Current account balance plus net foreign direct investment Gross external debt of the general government External interest service Foreign exchange reserve	
Moody's				
Economic assessment	Fiscal assessment	Institutional assessment	„Event” risk	
Real GDP growth Real GDP growth volatility WEF Global Competitiveness Index Nominal GDP GDP per capita <i>Diversification</i> <i>Credit boom</i>	Public debt Debt burden Debt trend <i>General government FX debt/General government debt</i> <i>Other public sector debt</i> <i>Public sector financial assets</i>	Government effectiveness Inflation Inflation volatility <i>Track record of default</i>	Domestic political risk Geopolitical risk Gross borrowing requirements Non-resident share of general government debt Market implied ratings Baseline Credit Assessment (BCA) Total domestic bank assets/GDP Banking system loan-to-deposit ratio Current account balance + FDI External vulnerability indicator Net international investment position	
S&P				
Economic assessment	Fiscal assessment	Institutional effectiveness	External assessment	Monetary assessment
GDP per capita <i>GDP per capita trend</i> <i>growth</i> <i>Diversification</i> <i>Credit boom</i>	Change in general government debt Net general government debt Interest payment <i>General government liquid financial assets, volatility of revenues</i> <i>Foreign currency government debt, remaining maturity</i> <i>Non-resident share of general government debt</i> <i>Flexibility of tax regime</i> <i>UN development index</i> <i>Demography</i> <i>Other public sector debt</i> <i>Sovereign exposure of banking sector</i>	Effectiveness, stability, predictability and transparency of policymaking and political institutions <i>Geopolitical and external security risk</i> <i>Debt payment culture</i>	Status of reserve currency Local currency in circulation <i>Current account balance</i> <i>Net international investment position</i> <i>International terms of trade</i>	Exchange rate regime Credibility and effectiveness of monetary policy Inflation Real exchange rate stability Level of financial intermediation credit market

Note: Indicators not in italics denote key variables, while those in italics denote adjustment variables.
Source: Fitch Ratings (2014); Moody's Investor Service (2013); Standard & Poor's Rating Services (2013)

One of the most consistent and common dimensions is the combination of economic structure and the factors capturing the growth outlook. Key variables include realised and expected real GDP growth and its volatility, as well as the size of the economy in absolute terms and relative to the population. Empirical experience proves that large economies and those with better growth prospects can bear heavier debt burdens or outgrow existing burdens faster. During the fine-tuning process, credit rating agencies typically examine the extent of diversification in the given economic structure: in other words, the extent to which growth fundamentals can be considered broad-based. If the drivers of growth are only a few sectors producing exports, this will be considered as a negative adjustment factor in the evaluation of the dimension. Likewise, it will be a negative adjustment factor if a “credit boom” (i.e. an overheated economic structure) is behind the growth.

The second distinct dimension involves variables grouped around fiscal policy and debt burden (general government dimension). Key variables include the expected fiscal deficit, gross and net general government debt-to-GDP ratios, and the interest burden relative to government revenues or GDP. Credit rating agencies perform adjustments by examining the structure of the debt, focusing on the following factors: ratio of foreign currency debt to general government debt, average remaining maturity, share of non-residents and banking sector exposure to government securities.

The third key dimension classifies the features of institutional efficiency. This dimension is less often cited by the specialised press than external vulnerability, fiscal burden or growth prospects. Nevertheless, during the evaluation it represents the same weight as the other dimensions and is also a significant factor in the explanation of credit rating actions. The lesser publicity given to this dimension might be the reason why it is harder to quantify than the rest of the key indicators; indeed, it is generally described by quantitative features. According to the methodological notes, a somewhat lower weight is assigned to this dimension by Moody’s and S&P than by Fitch. Moody’s and Fitch provide a clear explanation of the variables considered, and both agencies rely primarily on World Bank indicators.⁶ In terms of substance, S&P examines the same elements; opposed to the other two agencies, however, it relies on internally generated indicators.

The fourth common aspect captures external balance processes. Key variables typically include net external debt, current account balance and FDI balance relative to GDP, and gross external borrowing requirement. S&P includes the status of a sovereign’s currency in international transactions. If the currency of a sovereign is globally considered a reserve currency or an actively traded currency, it will be used as a positive adjustment factor.

⁶ World Bank Government Effectiveness Index, World Bank Rule of Law Index, World Bank Control of Corruption Index, World Bank Voice & Accountability Index

As opposed to the other two agencies, S&P assesses the effectiveness, flexibility and institutional features of monetary policy in a separate dimension and assigns a higher weight to this variable compared to its peers. With respect to the exchange rate regime, S&P gives a high score for flexible and/or actively traded currencies. The initial score given to the dimension of monetary policy credibility and effectiveness is shaped by several factors concurrently (institutional independence, clear monetary policy target and instruments, price stability, functioning as lender of last resort). In addition, the agencies consider the level of development of the financial intermediary system and the credit market, the strength of the transmission mechanism, the potential presence of capital controls and the degree of dollarization.

Based on the available methodological notes of the three market leader credit rating agencies and additional information included in the announcements accompanying the review of credit ratings, we found that S&P and Moody's perform better in terms of transparency⁷ than Fitch. The current methodological notes of Fitch merely provide a list of the indicators considered without elaborating on their evaluation and the weights applied. In the absence of this information, however, it is not possible to provide an estimate about the indicative range; therefore, in the following section we present the features of Moody's and S&P's methodologies. Similarly, we limit our examination of the methodologies' applicability to these two agencies.

2.3. Special features of Moody's methodology

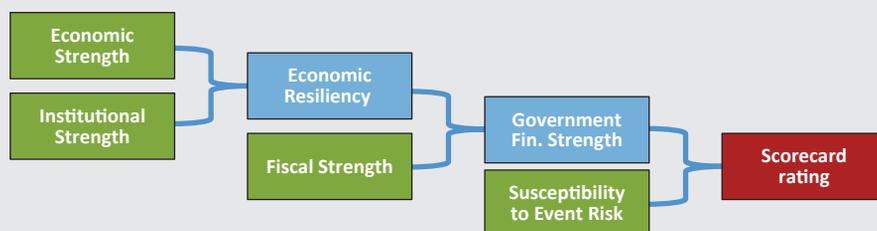
In addition to the indicators determining the basic score of each dimension, Moody's makes available the absolute scales serving as a basis for the evaluation, as well as the weighting of individual indicators within the given dimension. At the same time, some of the adjustment factors responsible for the fine-tuning of the basic score of each dimension do not have an evaluation scale, or the factor to be captured is not measured explicitly by a specific indicator. This indicates that the indicative rating range calculated on the basis of the scorecard can only be reproduced with significant uncertainty.

In the first round, Moody's combines the macroeconomic and institutional strength dimensions with equal weight into a single construct. The only exception is the case where a sovereign receives a lower or a higher score in one of the dimensions, in which case Moody's assigns a weight of 2/3. The score constructed from the combined weighting of the two dimensions above is then compared

⁷ We examined the level of transparency on the basis of the following criteria: the extent to which the indicators considered are explicitly explained; availability of scales applied for the evaluation of the indicators; availability of the weighting assigned to individual dimensions; the extent to which the values calculated for individual indicators are available; availability of an indication by the agency regarding the current evaluation of individual dimensions.

to fiscal strength, with a special grid providing the weighting. The weight of the score received from the combination of economic and institutional strength (i.e. economic resiliency) is higher in the case of a high score, moderate in the case of medium performance, and also high in the case of a low score. This means that the value received for the fiscal strength dimension is less relevant for sovereigns characterised by a very strong or very weak macroeconomic environment and institutional strength (economic resiliency). Finally, based on yet another weighting grid, the methodology compares the score value attained in this way with the “event risk” dimension, where the first three dimensions (government financial strength) dominate; however, the strength of this dominance can only lower the preliminary rating range as given by the score received for government financial strength (*Moody’s Investor Service 2013*).

Figure 5.
Schematic diagram of the aggregation of the dimensions included in Moody’s methodology



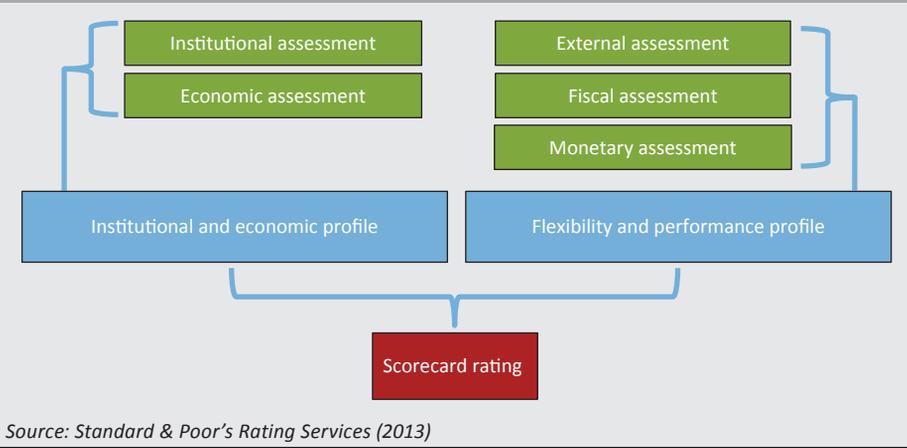
Source: *Moody’s Investor Service (2013)*:

External balance processes are presented by Moody’s in a different manner than by its two peers. In the last dimension, Moody’s examines susceptibility to event risk. External risk, however, is only part of this factor, presented alongside political risk, government liquidity risk and banking sector risk. In addition, even the weighting is different in the case of this dimension, as the score received by the dimension is determined by the factor that is considered the riskiest.

2.4. Special features of S&P’s methodology

The weighting process is somewhat simpler in the case of S&P. In the first round, the methodology calculates a simple arithmetic average separately for the macroeconomy and the institutional effectiveness dimensions and separately for the combination of fiscal performance, external balance and monetary policy. It then calculates an indicative rating range from these two profiles based on a special weighting grid. It should be noted, however, that this indicative rating can be adjusted by as much as two notches based on a comparison to other factors, such as benchmark countries (*Standard & Poor’s Rating Services 2013*).

Figure 6.
Schematic diagram of the aggregation of the dimensions included in S&P's methodology



The methodology published by S&P includes explicit indicators and the relevant scales in about half of the cases; in the rest of the cases the agency provides a description of the given dimension along with the evaluation criteria. The analysis of the aforementioned institutional effectiveness dimension is fully based on internally generated indicators and expert estimates.

3. Questions regarding the applicability of the methodology

Next we examine the extent to which we can draw conclusions regarding the actual credit rating by using the respective methodologies of Moody's and S&P. It is important to note at the outset that the gap between the actual rating and the rating calculated by us based on the methodology can be attributed to two factors. On the one hand, as the methodological notes emphasise, the rating actually maintained might be outside of the range calculated by the credit rating agencies. We are unable to verify this statement based on the information that is available free of charge. The second uncertainty factor arises from the reproduction of the range calculated by the credit rating agencies, which primarily depends on the transparency of the methodology and the data available (the extent to which the statistics used by the credit rating agencies and those used by us are consistent with each other). The extent to which we can explain the actual rating based on the models can be attributed to the combined presence of the two uncertainty factors, which, under the current circumstances, are impossible to separate.

We used the data sources specified in the methodological notes in the case of both credit rating agencies, and we tried to rely on the data disclosed by the two agencies to the greatest possible extent. The countries reviewed by Moody's are limited to member states of the European Union, while the sample used by S&P is far more

diverse geographically. We calculated the model for the end of 2014, as this was the first year when the respective methodologies suitable for the construction of the model were simultaneously available both in the case of Moody's and S&P. Since Moody's provides rather limited information on the individual variables in the announcements accompanying rating actions, we relied on the IMF's estimates in the case of indicators that include projections. By contrast, since S&P discloses its calculations regarding the key variables that determine the basic score for each quantitative dimension (three out of five), in the relevant calculations we relied on the values provided by S&P. The differences between the two country samples are explained by the broader range of data disclosed by S&P.

Beyond publishing the methodological notes, both S&P and Moody's provide guidelines on the evaluation of each dimension in the given credit rating action. With respect to transparency, S&P performs better overall: besides the values calculated for the key variables, the agency also discloses which third of the six-point numerical scale the scores assigned to the five reviewed dimensions fall into. Moody's discloses in which fifth of the scale it places the dimension constructed from the combination of the first two dimensions. Accordingly, we performed our own model calculations in two different ways: without or with consideration to the dimension evaluations of the credit rating agencies. Thus, the second approach reduces the uncertainty of the reproduction of the range calculated by the credit rating agencies.

3.1. Applicability of Moody's model

In the case of Moody's – in the absence of values calculated by the institution – we relied solely on publicly available information in the first approach. The gap between the midpoint of the indicative rating range calculated by the model and the rating maintained by the credit rating agency demonstrates the great uncertainty surrounding the extent to which we can infer the actual rating. The actual ratings fell into the range calculated by us only in the case of eight countries out of the 28 EU member states. In the second approach, we also used the information provided by the agency regarding its evaluation of the dimension constructed from the combined weighting of the first two dimensions for the countries under review. As expected, the descriptive statistics improved and the distribution around the actual rating became more symmetrical; however, the explanatory power of the model remained weak. Although in this case the actual ratings fell into the midpoint of the range in the case of ten countries out of the 28 Member States, this does not imply that we reconstructed the range calculated by Moody's, given that there might even be a two-notch gap between the midpoints (assuming that Moody's maintains the actual rating within the range derived from its own calculations). In our view, the weak explanatory power of the model can be attributed to the following:

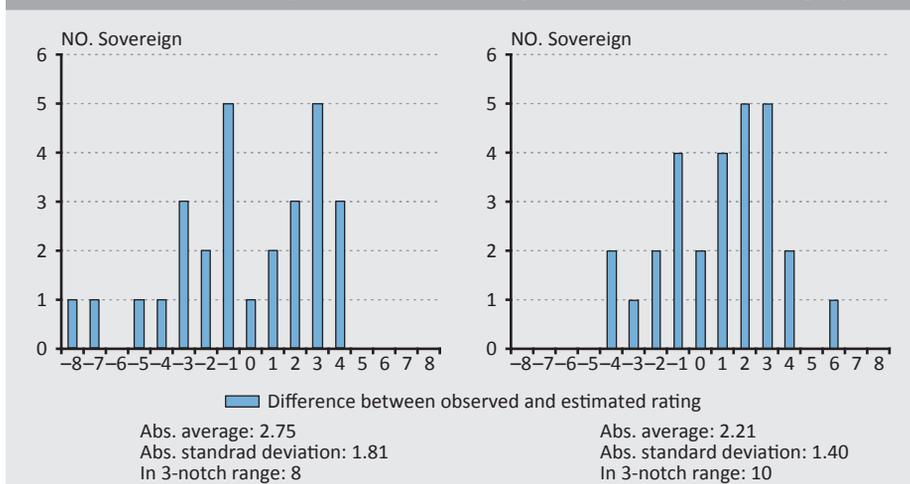
- i.* As mentioned above, the currently available methodology of Moody's provides no information about the weightings and scales applied in the case of the adjustment factors that modify the basic score of the respective dimensions.

In our calculations, this may render the reconstruction of the ratings problematic for euro area core countries primarily, given that – based on the announcements – we assume that the variable capturing the degree of diversification may result in a positive adjustment of the estimated range. This view is also supported by the fact that the midpoint calculated by us was consistently 3 to 4 notches lower than the actual rating for countries holding an “Aaa” rating.

- ii. Combined with the problems surrounding the adjustment factors, the calibration of the scales and weights applied by the methodology reduced the model’s ability to capture the ratings of countries in the periphery of the euro area. The midpoint calculated by us consistently points to higher credit ratings for these countries. In this case, we cannot rule out that Moody’s itself calculates a higher range, and thus country-specific factors causing diversions from the range might play a relevant role in the case of the countries most affected by the debt crisis of the euro area.
- iii. Finally, we should also consider that the IMF and Moody’s use somewhat different paths in the case of projected values. In view of the modest number of the relevant indicators, this factor may play only a minor role.

Based on the results of the model reconstruction, we concluded that at the current level of transparency the explanatory power of Moody’s methodology can be considered weak. While it can provide insight into certain credit rating actions ex

Figure 7.
Gap between the actual credit rating maintained by Moody’s at the end of 2014 and the midpoint of the rating range calculated from the model without Moody’s dimension evaluation (left panel) and with Moody’s dimension evaluation (right panel)



Note: Negative values indicate that the midpoint of the rating range calculated by us points to a better rating than the actual rating maintained by Moody’s at the end of 2014.

Source: Moody’s and own calculations

post, it appears to be less suitable for determining the rating level. While we cannot rule out that the model is better suited to capture rating changes, given the lack of the relevant time series this cannot be verified. This topic may become the subject of subsequent research.

3.2. Applicability of S&P's model

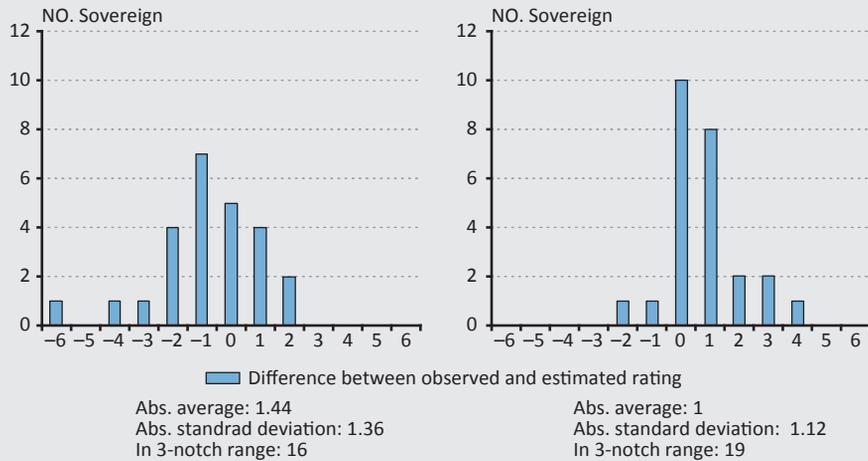
In the case of S&P, in the first approach we evaluated the individual dimensions based on the latest indicators disclosed by the credit rating agency supplemented by publicly available data provided by third parties. Accordingly (similar to Moody's methodology), we determined the qualitative dimensions of institutional and political effectiveness by using the Worldwide Governance Indicators published by the World Bank and by the Corruption Perception Index of Transparency International. In calculating the monetary policy dimension, we relied on, among other things, inflation and real exchange rate data and the exchange rate classification of the IMF.

For the purposes of the second approach, we also used information pertaining to the dimension evaluations of S&P. In the case of the monetary dimension, we considered the average of the two-category range provided by S&P, while consistently using the worse value of the range in the case of the institutional and political effectiveness dimension for the sake of the consistency of the model. In addition, we applied another change in relation to the macroeconomy, external balance and fiscal flexibility dimensions. Where the two-category range provided by S&P did not include the score calculated in the first approach, we adjusted the relevant dimension score to the nearest value of the range provided by S&P.

Even in the first approach, the explanatory power of the methodology appears to be strong. For 16 out of the 25 sovereigns under review, the actual credit ratings maintained by S&P at the end of 2014 fell into the 3-notch range calculated by us. This suggests that even without S&P's dimension evaluation, we could approximate the actual rating fairly well solely by using the values provided for the key variables and the indicators capturing qualitative dimensions. Once we included the information on dimension evaluations, the number of states falling into our calculated range increased to 19; in other words, the explanatory power improved further. As expected, average deviation and dispersion also improved in the second approach. The dispersion of the deviations observed in the first approach indicates that the ratings calculated from the model tend to be slightly better. Once we included the information provided on the dimension evaluations, this difference disappeared, which makes us assume that country-specific factors – which are hard to capture by the methodology – may point to a worse credit rating. This was actually observed in the case of the PIGS countries.

We may conclude overall, that the model constructed on the basis of S&P’s methodology has a rather strong explanatory power, which – besides supporting the reconstruction of the relevant rating actions – also enables us to make forward-looking estimates about expected ratings.

Figure 8.
Gap between the actual credit rating maintained by S&P at the end of 2014 and the midpoint of the rating range calculated from the model without S&P’s dimension evaluation (left panel) and with S&P’s dimension evaluation (right panel)



Note: Negative values indicate that the midpoint of the rating range calculated by us points to a better rating than the actual rating maintained by S&P at the end of 2014.

Source: S&P's and own calculations

Case study

Reconstruction of S&P’s last three rating actions regarding Hungary, based on the methodology provided by S&P

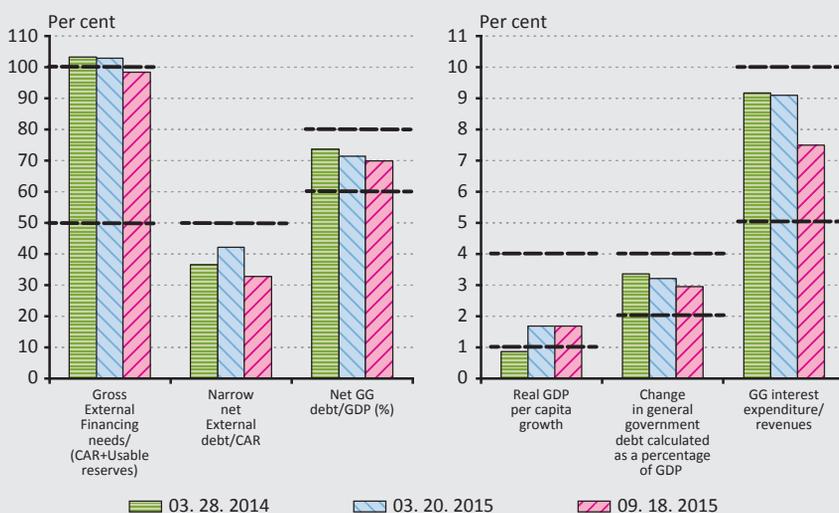
The purpose of the case study presented below is to shed light on the applicability of the information shared by S&P at the current level of transparency with respect to the processes of sovereign credit rating and the background of specific rating actions. Based on S&P’s methodology and by using the numbers and dimension evaluations provided in the announcements, we

1. present changes for the past 1.5 years in the key variables pertaining to Hungary, according to S&P’s calculations;
2. reconstruct the way in which Hungary may have been evaluated based on the five dimensions and the resulting rating range calculated by the model; and

3. estimate the possible direction of the indicative credit rating in 2016, according to the model.

The presented key variables capture the three most easily quantifiable dimensions (macroeconomy, fiscal flexibility, external balance) of the five. We present the evaluation of institutional effectiveness and monetary policy as we describe the result grid. We performed calculations for three dates, in the following order: Hungary's negative outlook assigned to its "BB" rating is adjusted to stable (28 March 2014); Hungary's credit rating is upgraded to "BB+" with a stable outlook (20 March 2015); S&P affirms the last rating on 18 September 2015.

Figure 9.
Values of the key variables included in S&P's methodology calculated for Hungary for the past 1.5 years



Note: Dotted lines indicate value thresholds which, once exceeded, may alter the score of the relevant dimensions. For the purposes of credit rating, a higher value is more favourable for real GDP per capita, while lower values are more favourable in the case of the rest of the variables. Besides fiscal deficit, changes in nominal general government debt-to-GDP are also influenced by other factors, such as the exchange rate.

Source: S&P's and own calculations

- The first, most prominent conclusion about the indicators is the fact that Hungary showed significant improvement with respect to each indicator, according to S&P, which may not only reflect the improvement of actual data, but also the improving expectations of the credit rating agency.

- It is also clear that the improvement not only affected flow-type indicators (such as the fiscal deficit), but also stock indicators (such as net general government debt), which remain high relative to benchmark countries.
- Some of these results were already reflected in S&P's decision to upgrade Hungary's credit rating from "BB" stable to "BB+" stable on 20 March 2015. At the same time, a substantial part of the favourable trend observed for the past 1.5 years can be linked to the last half year of the review period.
- For two of the six key variables, the improvement exceeded the critical threshold. The upgrade in March 2015 was largely driven by the acceleration of average real per capita GDP growth in excess of 1 per cent. The fact that the indicator capturing external vulnerability dropped below 100 per cent has a forward-looking significance.

For the reconstruction of individual rating actions, besides evaluating the qualitative dimensions (institutional effectiveness and monetary policy), we need to reproduce the entire model calculation. We know that S&P's evaluation of institutional effectiveness placed Hungary in the medium third for the past 1.5 years. In our view, it may have been assigned a score of 4 to this day, based on the evaluation of the dimension. Based on the GDP per capita data, at the time of the March 2014 decision the initial score of the macroeconomy dimension was 4. This was worsened to 5 by the sluggish recovery of the post-crisis years and by the lingering of the average per capita real GDP growth rate below 1 per cent as a result of the less robust growth outlook. This is how the institutional and macroeconomy profile received a value of 4.5, calculated as the average of 5 and 4. In our estimate, the value of the other profile, calculated as the average of the evaluation of the three remaining dimensions (external balance, fiscal and monetary policy) may have been 3.6. Based on the result matrix, the two profiles marked the "BB" midpoint, which was identical with the credit rating maintained by S&P in March 2014.

Calculated for March 2015, the average per capita real GDP growth rate must have been over 1.7 per cent, thanks to the significant improvement in Hungary's growth outlook. This value already returned to the 1–4 per cent growth range assigned to our category calculated on the basis of nominal per capita GDP; in other words, the negative adjustment factor lost its relevance. For that reason, the institutional and macroeconomy profile improved to 4 from the previous value of 4.5. In our estimate, the evaluation of the other profile was adjusted to 3.37, mainly as a result of the improving monetary policy dimension (which, based on the announcements, may have been driven

by S&P's view that the conversion of household foreign currency loans to forint loans strengthened the channel of monetary policy transmission). The matrix marked the midpoint of "BB+" in March 2015, and this is identical with the level to which S&P upgraded Hungary.

Figure 10.

Changes in Hungary's estimated indicative credit rating for the past 1.5 years based on S&P's methodology and projections, and possible future trends

Flexibility and performance profile	Institutional and economic profile											
	Category	1	1,5	2	2,5	3	3,5	4	4,5	5	5,5	6
1 – 1,7	aaa	aaa	aaa	aa+	aa	a+	a	a-	bbb+	N/A	N/A	
1,8 – 2,2	aaa	aaa	aa+	aa	aa-	a	a-	bbb+	bbb	bb+	bb-	
2,3 – 2,7	aaa	aa+	aa	aa-	a	a-	bbb+	bbb	bb+	bb+	b+	
2,8 – 3,2	aa+	aa	aa-	a+	a-	bbb	bbb-	bb+	bb	bb-	b+	
3,3 – 3,7	aa	aa-	a+	a	bbb+	bbb-	bb+	bb	bb-	b+	b	
3,8 – 4,2	aa-	a+	a	bbb+	bbb	bb+	bb	bb-	b+	b	b	
4,3 – 4,7	a	a-	bbb+	bbb	bb+	bb	bb-	b+	b	b-	b-	
4,8 – 5,2	N/A	bbb	bbb-	bb+	bb	bb-	b+	b	b	b-	b-	
5,3 – 6	N/A	bb+	bb	bb-	b+	b	b	b-	b-	<=b-	<=b-	

Source: Standard & Poor's Rating Services (2014a) and own calculations

For the evaluation of future prospects, the numbers disclosed upon the affirmation of Hungary's rating in September 2015 provide a realistic starting point. With respect to the key variables, as mentioned above, the value of the indicator capturing the external vulnerability of the country dropped below the critical threshold of 100 per cent. This favourable outcome may improve the score of the external balance dimension to 2 (from the previous 3). In our estimate, this would reduce the score of the profile calculated from the combination of this value and the remaining two dimensions to 3.03. Based on the result matrix, this would raise the midpoint of the indicative rating range to "BBB-". In our view, this process did not take place during the September 2015 review because, based on the methodology, S&P has an option to decide which score to apply in the case of external vulnerability indicators with borderline scores. It is highly probable that the indicator remains below 100 per cent in 2016 as well, which would reconfirm the upward trend. S&P might be more willing to opt for the better score which, *ceteris paribus*, may lead to the indicative range of "BBB-" and ultimately to an upgrade.

4. Conclusions

Owing to the regulatory efforts commenced in recent years, credit rating agencies have rendered credit rating processes increasingly more transparent. They publish their analytical framework (methodology), and the announcements accompanying their credit rating actions provide an increasingly broader view of the criteria assessed and the calculations considered in their decisions. In general, the methodology enables users to interpret the textual or calculation-supported justifications of rating actions in a uniform framework. We found that at the current level of transparency, in the case of S&P the methodology and the information included in the announcements constitute an adequate basis for an estimation of the indicative rating range and, ultimately, a reconstruction of individual rating actions. In the case of Moody's, the estimation of the indicative rating range is surrounded by a high degree of uncertainty. As regards Fitch, on the basis of the current methodology and given the lack of weighting and scale information, no estimate can be performed for the time being.

Although with respect to Moody's actually observed credit ratings typically fell outside of the calculated rating range, we cannot rule out that the currently available methodology is better suited to explain rating changes. In the absence of the required time series, however, the verification of this assumption must be the subject of future research. Similarly, the rating changes executed by S&P could also be examined, and estimates could be provided even for shifts within the range. For this exercise, however, the analytical framework needs to be enhanced. Using outlook data and the textual analysis of the announcements may point to possible future directions in this regard.

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