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USE OF THE KEY RISK INDICATORS METHOD IN RISK MANAGEMENT STRATEGIES

ВИКОРИСТАННЯ МЕТОДУ КЛЮЧОВИХ ПОКАЗНИКІВ РИЗИКУ В СТРАТЕГІЯХ РИЗИК-МЕНЕДЖМЕНТУ

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Abstract. *As part of the rapid development of the global economy in recent decades, a clear demand for timely and effective response to changes in the macroeconomic environment of the multinational enterprises (MNE), as well as the influence of endogenous factors on the achievement of operational and strategic goals of the enterprise, is created within the framework of the corporate governance structure of MNE. Such changes and factors can create both risks and opportunities for MNE. As part of the strategic planning processes, modern MNE must identify and assess risks and opportunities in relation to the key objectives of their strategy and assess the potential change in the risk profile of the enterprise, if there are changes in the strategy and any of its sensitivity to internal or external factors. Existing and new risk management strategies should become an integrated part of the operational and strategic planning process of MNE. At the same time, an effective system of key risk indicators (KRI) is an important component of an effective risk management strategy of MNE, based on a holistic approach to the organizational structure of MNE and taking into account the geographical, functional, operational specifics of the enterprise's business.*

Applying a natural methodological basis, the article describes the concepts and principles of KRI, their typology and the order of determination. As part of the practical analysis, the role and place of KRI in the system of operational and strategic activity of MNE were determined, as well as a study of the use of KRI was carried out on the example of the collapse of the US residential real estate market in 2007.

The conducted study showed the high efficiency of the practical use of KRI to achieve the goals of MNE and increase the efficiency of their business activities.

Key words: *risk management strategy, risk management, key risk indicator.*

JEL Classification: *D81, G32, G34, L21, M16*

Анотація. *В рамках стрімкого розвитку світового господарства останніх десятиліть в рамках структури корпоративного урядування багатонаціональних підприємств (БНП) створюється чіткий запит на вчасне та ефективне реагування на зміни*

в макроекономічному середовищі діяльності БНП, а також впливу ендогенних факторів на досягнення операційних та стратегічних цілей підприємства. Такі зміни та фактори можуть створювати як ризики, так і можливості для БНП. В рамках процесів стратегічного планування сучасні БНП мають проводити ідентифікацію та оцінку ризиків і можливостей по відношенню до ключових цілей своєї стратегії та оцінювати потенційну зміну в профілі ризику підприємства, якщо є зміни в стратегії та будь-яка її чутливість до внутрішніх або зовнішніх факторів. Існуючі та нові стратегії ризик-менеджменту мають стати інтегрованою частиною процесу операційного та стратегічного планування БНП. Водночас дієва система ключових показників ризику (Key risk indicator, KRI) є важливою складовою ефективної стратегії ризик-менеджменту БНП, базуючись на холістичному підході стосовно організаційної структури БНП та враховуючи географічну, функціональну, операційну специфіку бізнесу підприємства.

Застосовуючи природничу методологічну основу, в рамках статті проведений опис понять та принципів показників KRI, їх типологія та порядок визначення. В рамках практичного аналізу визначені роль та місце показників KRI у системі операційної та стратегічної діяльності БНП, а також проведене дослідження використання показників KRI на прикладі краху ринку житлової нерухомості США 2007 року.

Проведене дослідження показало високу ефективність практичного використання показників KRI для досягнення цілей БНП та підвищення ефективності їх бізнесової діяльності.

Ключові слова: *стратегія ризик-менеджменту, управління ризиками, ключовий показник ризику.*

JEL Classification: *D81, G32, G34, L21, M16*

1. Introduction

Shortening the duration of economic cycles of the world economy, rapid internationalization, and the development of multinational enterprises (MNE) in the last two decades emphasized the relevance and urgency of developing effective tools for timely management of response to such changes. One of the fundamental elements of the MNE corporate governance system is the monitoring of trends and indicators that provide relevant information that serves to make timely decisions and focus on the most urgent aspects. Endogenous and exogenous environmental factors can create both risks and opportunities for MNE. That is why the formation of an effective system of key risk indicators, which, on the one hand, allows judging the level of susceptibility of the MNE to a specific risk, its dynamics over time, and on the other hand, signals a change in the level of risk and the effectiveness of measures for its management.

As the key risk indicators are critical predictors of adverse events, they can also serve as an effective part of the budget planning process and help align MNE priorities with the changes and uncertainties an enterprise is experiencing.

2. Basic concepts and principles of key risk indicators

The concept of key risk indicators (KRI) must be considered through the risk management process as part of the risk management strategy of multinational enterprises (MNE), an important stage of which is risk monitoring and reporting. The most effective method of this stage is the use of KRI.

In general, indicators are indicators used to monitor identified risks over a period of time. Any piece of data that can perform this function is a risk indicator. An indicator can be considered a risk indicator if it can be used to measure the impact of a particular risk or set of risks. An indicator becomes "key" when it tracks a particularly important risk (key risk) of the MNE and/or does so particularly effectively (key indicator). The main task of KRI is early notification of a change in the level of risk, the effectiveness of risk mitigation measures (including control), as well as for risk monitoring.

KRI play an important role in the risk management strategy of MNE, providing the

following information [*Kirvan*]:

- advance notification of potential risks that may harm MNE;
- understanding of possible weaknesses in BNP monitoring and control tools;
- continuous monitoring of risks between risk assessment cycles within the framework of the relevant process.

It should be noted that the task for MNE is not only to define risk indicators as key, that is, the most important, but also to ensure internal acceptance of its KRI. MNE must communicate risk warnings in such a way that every employee in the organization clearly understands their meaning and can respond accordingly.

In the internal corporate etymology of MNE, it is important to distinguish KRI from key performance indicators (KPI), which are indicators that help MNE assess progress in achieving stated goals.

KRI and KPI are functionally opposite to each other. Although they may be separate and distinct for some issues, the creation of one often leads to the creation of the other as its complement.

KRI provide information on risks and their potential impact on MNE business performance. They function as early warning tools to monitor, analyse, manage and mitigate key risks. In contrast, KPI demonstrate how well MNE is achieving its goals and objectives, such as sales, revenue, and customer satisfaction.

Table 1 provides examples of key performance indicators and their corresponding risks and KRI [*Kirvan*]:

Key performance indicator, KPI	**Risk**	**Key risk indicator, KRI**	
		Description	**Measurement example**
Staff			
Full-time employment is required for the optimal operation of MNE	Loss of staff	Monthly dynamics of the number of employees	The total number of employees is reduced by 20% or more
Employee satisfaction with the enterprise and their work is important for successful work	Employee dissatisfaction	Monthly dynamics of the number of employee complaints	The number of employee complaints increases by 15% or more every month
Production processes			
Production of an important product is maintained at a level sufficient to meet demand	Production of a key product is not keeping up with demand	Weekly change in warehouse stocks of a key product	The volume of warehouse stocks of a key product is reduced by 20% or more
The existing product design is satisfactory and delivers the expected value and results for customers	Existing product designs are becoming increasingly outdated and may lead to reduced sales	Monthly sales dynamics of products whose design has not changed over the past year	Product sales fell by 20% or more compared to the previous level
Information technology			
IT system disruptions due to cyber-attacks are minimized through regular patching of cyber security	Disruption of IT systems due to cyber attacks	Execution of the schedule of corrections of the cyber security system	Cyber security patching is two patches behind the planned and recommended level

systems			
Business disruption is minimized as systems, files and databases are backed up to their last recovery point	Failure to restore systems, data files, and databases to their current state after a crash due to a backup failure	Running a backup schedule	Backup system notification when backup level drops below a minimum acceptable time period

Table 1. Difference between key performance indicators (KPI), risks and key risk indicators (KRI)

At the same time, for effective use in the operational activities of MNE, the developed KRI should follow the following principles:

1. According to the "*Effectiveness*" principle, the key risk indicator should meet the following requirements:
   - relate to the specific risk of MNE;
   - be measured over a reported or forecasted time period;
   - have an objective (historical or predictive) justification;
   - measure the quantitative characteristics of the process exposed to potential risk (for example, the probability of occurrence, the amount of losses);
   - contain information for making a management decision.
2. According to the principle of "*Following*", the key risk indicator should meet the following requirements:
   - adhere to the initial unit of measurement (percentages, proportions, shares);
   - be accurate enough (no more than 2-5% deviation is allowed during data processing);
   - be able to adapt in the event of a change in the assessment methodology and/or performance of the business function;
   - to be formed from the primary sources of MNE business processes.
3. According to the "*Ease of Use*" principle, the key risk indicator should meet the following requirements:
   - be available and open (without a need to form additional requests);
   - not be costly in the process of data collection;
   - be easy for perception and further analysis.

As part of the development of key risk indicators, it is also important to identify the three main characteristics of KRI [*Rodriguez A., Chadha V.*, 2016]:

1. *Dynamicity*. KRI are dynamic in nature, so the process of defining, implementing, and using of KRI should not be linear or done only once. As the risk environment changes, the list of indicators should be refined to reflect changes in the risk profile, strategy, and internal and external environments. Continuous review and improvement are required to ensure that the most significant KRI are monitored, timely and high-quality data is obtained, appropriate thresholds are established, and appropriate escalation protocols are in place. An initial set of KRI will not be 100% comprehensive, developing effective KRI is an ongoing process.
2. *Multidimensionality*. KRI metrics should include the full context of the situation. For example, counting "unsuccessful trades" does not say anything about the trading process itself. However, when combined with another metric, "trading volume," this pair provides perspective and holistic view. A multidimensional indicator can be a percentage of failed deals by deal volume. From this perspective, an increase in volume may indicate an increase in failures, but the ratio is constant and does not trigger any action.
3. *Relevance*. It is important that the determined KRI are relevant for MNE. Such relevance can be achieved by the following approaches:

a. **Top-down approach** involves reviewing MNE strategy, highlighting strategic goals. Mapping key risks to key strategic initiatives provides an opportunity to begin identifying top-line indicators that can serve as leading KRI to monitor the execution of MNE's key strategic initiatives. KRI mapped to key risks and key strategic initiatives reduce the likelihood that MNE management will be distracted by other information that may be less important to achieving MNE goals.

b. **Bottom-up approach** is the result of spreading a wide net across multiple metrics that are captured within the organization. With the help of expert knowledge, analysis of historical trends, lessons learned, and other qualitative or quantitative information, risk managers can begin to align the list of indicators with the identified key risks. This refinement will take some time.

3. Role model and structure of the key risk indicators system

An effective system of key risk indicators is an important component of an effective risk management strategy of MNE. That is why the role model of such a system should be based on a holistic approach to the organizational structure of MNE and take into account the geographical, functional, operational specifics of the enterprise's business. The RACI matrix is the most effective method of forming a role model of the system of key risk indicators of MNE. It provides for the division of all system participants according to four functions [*Miranda D., Watts R.*, 2022]:

- *R (responsible)* – responsible for development;
- *A (accountable)* – responsible for the step as a whole, approves the results;
- *C (consulted)* – consults before implementation, agrees;
- *I (informed)* – informed after execution.

In order to form the basic role model of MNE KRI system, it is necessary to define four typical roles within the framework of the MNE organizational structure [*Rodriguez A., Chadha V.*, 2016]:

- *Leader* – this person provides leadership and management of the KRI system;
- *Steward* – this person is responsible for collecting, validating data quality, and posting KRI information to a system or location as defined by the KRI framework. In some cases, this may be the same person as the KRI;
- *KRI owner* – is the person responsible for monitoring and first responding to KRI;
- *KRI analytics team* – is the person or team responsible for the overall analysis of the aggregate of all KRI for further reporting to MNE management.

According to the typical roles outlined above within the organizational structure of BNP, the role model of the system of key risk indicators according to the RACI matrix method will look according to Table 2.

Action	**MNE Management**	**Leader**	**KRI analytics team**	**KRI owner**	**Steward**	**Heads of business functions**
Governance system	A	R		R		R
KRI identification		A		R		
KRI assessment		A		C	R	
Collection of data on KRI		A		C	R	
Data quality assurance		C		R	A	
KRI data posting		I	I	R		
Setting KRI		A		R		

thresholds						
Analysis (overall)		A	R			
Analysis (KRI level)		A		R		
Reporting (aggregated)	I	A	R			
Reporting (functional)		A	C	C		R
Effectiveness evaluation		A		R		I

Table 2. Role model of the system of key risk indicators according to the RACI matrix method

One of the key components of the MNE KRI system is the analysis of the collected data. Analysis and synthesis of a large set of structured and unstructured information can be a serious challenge for MNE, as it is important not only to collect information, but also to isolate dependencies that lead to an understanding of both existing risks and emerging risks. Participants of the KRI system need to do more than simply review and transmit data, they must help the recipients of the provided information understand it. The KRI analytics team can reduce the volume of data several times as part of its evaluation and formation of context and narrative. The team can evaluate structured and unstructured information using the following methods:

- *Comparison of data points*. Similar data points in time can be useful comparisons to understand the directionality or similarity of information. The KRI system can use past and current collected data to determine trends and dynamics.
- *Evaluation of datasets*. Looking at metrics that share common points of relationship provides a more complete picture of the element being measured: a strategic objective, risk appetite, enterprise risk, or key control element.
- *Trend analysis*. Viewing specific KRI data over a period of time allows to assess embedded patterns and gain a more accurate view of an existing or potential trend.
- *Changes in the business environment*. A comprehensive view of the occurrence of past and expected future changes contributes to the analysis and structuring of information. Assessment of the business environment is a structured process that identifies important changes that may affect MNE or its key elements (strategy, market share, regulatory reporting, etc.). The process of assessing the business environment consolidates the vision of what is changing and becomes an effective basis for the formation of KRI.
- *Building connections*. Risks usually do not exist in isolation and the whole cannot be the sum of its parts. Therefore, considering KRI as individual variables to generate risk alerts is not as effective as considering them as a system. A systemic view allows for the identification of interrelated variables as a holistic picture of risk. Making connections requires applying intuitive methods of analysis, using internal and external data, and testing theories. Links often need to be confirmed with subject matter experts who own processes or controls at different levels in MNE.

The design and development of a KRI system should cover the entire KRI life cycle from identification and creation to re-evaluation and deletion. An effective system also establishes governance relationships that should be consistent with the overall organizational structure of MNE.

An important element of the KRI system within the organizational structure of MNE is the determination of KRI threshold values, which act as a tool for controlling and monitoring the status of risk drivers, the exceeding of which is a signal to MNE management to make appropriate risk management decisions. Determination of threshold values of key risk indicators can be carried out on the basis of the following approaches:

- *An objective approach* involves taking into account the limitations that exist in the legislation and internal documents of the MNE.

- *A subjective approach* involves the use of expert judgment based on the results of a survey or questionnaire of risk owners or other key employees of MNE. With this approach, experts, on the basis of available experience and knowledge, determine the limit level (acceptable level) of the key risk indicator.

4. Typology and procedure for determining key risk indicators

Within the framework of the system of key risk indicators, the typology of KRI based on the general attributes of the indicators, which are based on the following characteristics [*Rodriguez A., Chadha V., 2016*]:

- *Primary use*: this attribute describes the primary intended use of the indicator, i.e., its relationship to the risk profile, level of control or performance against the MNE's business objectives.
- *Additional use*: although an indicator usually has a primary profile that it informs, there may be additional uses that, when combined with other metrics, provide additional information and a more holistic approach to a different task or monitoring.
- *Measurability*: KRI should be measurable. Even with a qualitative assessment, there should be a quantitative measure to provide an understanding of the measure.
- *Globality*: KRI can be common to different jurisdictions or lines of business of MNE, when the collection of information on the indicator takes place locally, and the measurement is centralized. Local KRI for different jurisdictions or specific KRI for individual lines of business may also be developed.
- *Time period*: KRI can be current, lagging, or leading (sometimes more than one, depending on usage).

The most widespread typology of KRI within the risk management strategy of MNE is the typology according to the time period. It can be used not only in MNE, but also in the analysis of the world economy. Below is a detailed description of the KRI according to the time period and their application for macroeconomic analysis.

Current KRI reflect the existing state of the metric or tend to move with the risk profile they measure. They are also used in macroeconomic analysis where the current KRI may be the employment rate, real earnings, average hours worked per week in manufacturing, and the unemployment rate.

Lagging KRI change when the tracked event changes. They can confirm trends, but not predict them. Economic examples of lagging indicators are unemployment, GNP profits, unit labor costs, and interest rates. During data analysis, trends in lagging KRI can form a leading indicator representation.

Leading KRI change before the risk they measure becomes apparent, such as a measurable economic factor that changes before the economy begins to follow a particular pattern or trend. Leading KRI can predict changes in the economy, but are not always accurate.

In macroeconomic analysis, lagging KRI change as the economy as a whole changes, current KRI show the current state of the economy, and leading KRI show where the economy is headed. All three of these KRI types can be used in combination to get a complete picture of where the economy has been and how it is expected to change in the future.

The procedure for determining KRI can be based on two methodological approaches:

1. *Based on risk factors*:

- key risk factors are determined for each selected risk. Each factor is analyzed for measurability, that is, for each risk factor, measurement units are determined (where possible), as well as the frequency of measurement of the indicator and the source of information for calculation;
- based on the risk factor, KRI are developed, which can be expressed in the form of coefficients, percentages, numbers, etc. After determining the KRI, their threshold values are determined;

- threshold values are a tool for controlling and monitoring the state of risk factors; threshold breakage is a signal to MNE management to make appropriate decisions on risk management.

2. *Based on risk mitigation measures*:

- for each risk mitigation measure, a unit of measurement of the level of performance of this measure must be defined, as well as a frequency of measuring the indicator and the source of information for calculation;
- the level of implementation of measures will be KRI. KRI developed on the basis of risk mitigation measures can be expressed as a percentage (percentage completed) or as an actual completion (completed or not completed);
- after determining the KRI, threshold values are determined for each KRI, which serve as a tool for controlling and monitoring the state of risk and implementing measures to reduce it.

5. The role and place of key risk indicators in the system of operational and strategic activities of MNE

The processes of implementation of the KRI system in operational and strategic planning, risk appetite of MNE should be clearly organized and coordinated in order to maximize the effectiveness of information use. That is why existing and new risk management strategies should be integrated into the general processes of operational and strategic planning of MNE.

During the strategic planning process, it is necessary to identify and assess risks in relation to the key objectives of the MNE strategy and assess the potential change in the risk profile of the enterprise, if there are changes in the strategy and any of its sensitivity to external factors. For example, a change in macroeconomic conditions and global economic prospects may encourage MNE to internationalize or regionalize its business. The study of such changes provides information for re-evaluation of existing or development of new KRI indicators, changes in their threshold values.

The MNE's strategic planning process can use KRI as input, which should be linked to existing strategic objectives. The trend or level of these KRI should provide a significant contribution to the implementation of the MNE strategy, and in the framework of portfolio analysis can signal its macroeconomic sensitivity.

As part of the system of operational and strategic activities, it is also important to understand how effective the developed KRI are, that is, how well the KRI system functions from the point of view of forming expectations regarding the future functioning of the MNE business. On the other hand, the effectiveness of the KRI system within the risk management strategy of MNE depends on the following internal corporate determinants of MNE [*Rodriguez A., Chadha V., 2016*]:

- *Data quality* – data quality assessment addresses any known issues with information quality, the level of control and performance of the quality control process, and problems or control failures identified by any source that are relevant to data quality.
- *Data collection* – assessing whether any kind of problems occurred during data collection. Problems can be related to supply failures (technical or process problems) or timeliness issues.
- *Follow-up steps* – assessment of whether actions have been taken in accordance with violations of threshold values.

Retrospective analysis also serves as an effective tool for analysing the effectiveness of the KRI system. As part of such an analysis, actual MNE losses are considered and a conclusion is drawn whether specific KRI predicted the realization of such a risk and, if so, what preventive measures were in place. If KRI for such losses were missing, this highlights the gap and should trigger the risk identification process. The results of the KRI system effectiveness checks and

internal corporate determinants determine the need to re-evaluate the KRI for relevance and practicality in relation to the BNP business.

6. Practical use of key risk indicators on the example of the 2007 US housing market crash

In 2007, the US economy entered into a mortgage crisis that led to panic and financial turmoil around the world and a recession that began the following year, damaging financial markets. In early 2007, the British multinational bank HSBC reported the first of its large losses related to subprime mortgage securities. Hundreds of mortgage companies failed, insurance companies such as American International Group (AIG) and international investment banks such as Bear Stearns were not spared. Other firms were bought at low prices or were on the verge of collapse, as in the case of Citigroup. The problems were so serious that one of the largest financial institutions in the world with huge reserves of capital, Lehman Brothers, was forced to file for bankruptcy. The collapse of Lehman Brothers in 2008 greatly destabilized the global financial system.

Bailouts from national governments, downturns in major financial markets, BNP bankruptcies, declining consumer welfare and reduced economic activity were just some of the effects of the global crisis of 2007-2008. It was attributed to a number of factors, not just the participants in the housing and lending market, but the main reason was the housing bubble due to the growth of subprime lending.

The genesis of the mortgage crisis and the collapse of the US housing market in 2007 was as follows [*DeGrace T., 2011*]:

- **2001**: The US Federal Reserve System (FRS) lowered the federal funds rate from 6.5% to 1.75%.
- **2002**: Annual home prices rose 10% or more in California, Florida and most of the north-eastern states, the highest rate since 1980. In June, US President George W. Bush set a goal of increasing the number of minority homeowners by at least 5,5 million by 2010 through tax breaks and subsidies. National Mortgage Association Fannie Mae has committed $440 billion to NeighborWorks America, a community development support organization.
- **2003**: Fannie Mae and home mortgage lender Freddie Mac purchased $81 billion worth of subprime securities. In June, Fed Chairman Alan Greenspan cut the key interest rate to 1%, the lowest level in 45 years. In December, President George W. Bush signed the American Dream Down Payment Act to provide a down payment grant of $10,000 or 6% of the purchase price of a home, whichever is greater. In addition, they committed to reforming the home buying process, which would reduce closing costs by approximately $700. The US President's administration expected these measures to further stimulate home ownership for all Americans. During the year, banks, mortgage underwriters and other lenders abandoned credit standards (employment history, income, down payments, credit score, assets, loan-to-value ratio and ability to service debt), instead emphasizing the lender's ability to securitize and repackage subprime loans.
- **2004**: US homeownership hits all-time high of 69.2%. The U.S. Department of Housing and Urban Development has raised Fannie Mae and Freddie Mac's affordable housing goals for the next four years from 50 percent to 56 percent, saying they lag behind the private market. From 2004 to 2006, they purchased $434 billion worth of subprime securities. In October, the Securities and Exchange Commission (SEC) suspended the net capital rule for five companies: Goldman Sachs, Merrill Lynch, Lehman Brothers, Bear Stearns and Morgan Stanley. Freed from government-imposed limits on debt ratios, these firms pushed them up to 20, 30, and even 40 to one. Arizona, California, Florida, Hawaii and Nevada recorded price increases of more than 25% per year.
- **2005**: Correction of the residential real estate market began. In February, the Office of Thrift Supervision introduced new rules that allowed savings and loans banks with more than $1 billion in assets to meet their obligations under the Community Reinvestment Act without investing in local communities, reducing the availability of subprime loans. In September, the Federal

Deposit Insurance Corporation, the FRS and the Office of the Comptroller of the Currency allowed the Community Reinvestment Act's requirements to be relaxed for "small" banks, further shrinking subprime loans. From the fourth quarter of 2005 to the first quarter of 2006, average home prices decreased by 3,3% nationwide. During 2005, less than 1% of all households were in some stage of foreclosure.

- **2006**: The slowdown in the residential real estate market continues. Prices remained flat and home sales fell, leading to inventory build-up. The level of foreclosures on residential real estate began to rise.
- **2007**: In the first quarter of the year, the S&P/Case-Shiller home price index recorded the first annual decline in nationwide home prices since 1991. The subprime mortgage industry collapsed, foreclosures rose, and rising interest rates threatened to push prices down even more as problems in the subprime markets spilled over into the prime mortgage markets. The level of foreclosures on residential real estate has increased significantly.
- **2008**: Home sales continued to fall. Fears of a US recession rose, while global stock markets saw a correction and volatility. In January, Bank of America, the largest U.S. bank by market value, agreed to buy financial group Countrywide Financial for about $4 billion. In March, the FRS agreed to guarantee $30 billion of investment bank Bear Stearns' assets to support its government-sponsored sale to investment bank JPMorgan Chase. In September, Fannie Mae and Freddie Mac were placed under external governance. During the week of September 15-22, 2008:
  - Lehman Brothers collapsed;
  - Merrill Lynch was acquired by Bank of America;
  - Goldman Sachs and Morgan Stanley became bank holding companies;
  - The insurance company AIG was saved;
  - The Reserve Fund was bailed out and other money market mutual funds were guaranteed;
  - Banks and financial intermediaries around the world stopped lending;
  - Federal Reserve Chairman Ben Bernanke and US Treasury Secretary Hank Paulson have asked Congress for $770 billion in Troubled Asset Relief Funds; Congress initially refused;
  - The US stock market (Dow) fell more than 700 points in one day;
  - As of the end of the year, the number of foreclosures on residential real estate increased by 81% compared to 2007.
- **2009**: as of the end of the year, the number of foreclosures on residential real estate increased by 21% compared to 2008.

The 2007 US mortgage crisis and housing market collapse had serious long-term consequences for the US and European economies. The US entered a deep recession when nearly nine million jobs, roughly 6% of the labour force, were lost during 2008 and 2009. Production losses due to the crisis amounted to at least 40% of the gross domestic product in 2007. US home prices fell by an average of nearly 30%, and the U.S. stock market fell by about 50% by the start of 2009 [*Feldstein M., 2009*].

As of early 2013, the US stock market had recovered to its pre-crisis peak, but home prices remained near record lows and unemployment remained high. Economic growth remained below the pre-crisis level. Europe also continued to struggle with its own economic crisis, with high unemployment and severe bank losses estimated at €940 billion between 2008 and 2012.

From the conducted analysis, it can be concluded that the mortgage crisis and the collapse of the US housing market in 2007 had a number of risk factors. Table 3 shows examples of key risk indicators, the timely consideration of which would have given all market participants clear signals about the approaching crisis.

№	Risk factor	Key risk indicator (KRI)	KRI value and its interpretation
1	**Low interest rates**	US FRS rate	• US Fed interest rates were historically low in 2003 and 2004 but began to rise after FRS began tightening monetary policy in mid-2004. Between 2004 and 2006, FRS raised interest rates 17 times, from 1% to 5,25%. Then, rate hikes stalled amid concerns that an accelerating downturn in the housing market could undermine the economy as a whole. • Economists ignored the sign because interest rates were still much lower than in previous recessions and the economy had enough liquidity to fuel growth.
2	**New residential real estate construction**	The number of issued permits for housing construction	• In November 2006, the number of issued housing permits fell by 28%, according to FRS report. • High employment, low inflation and rising consumer spending were expected to pull real estate out of recession by late spring 2007.
3	**Rising of housing prices**	Changes in residential property prices	From 1997 to 2006, residential real estate prices in the US increased by an average of 124%.
4	**Increase in subprime lending**	Growth of subprime mortgage loans	The growth of subprime mortgage loans changed from +8% in 2004 to +20% in 2006.
5	**Increase in household indebtedness**	Change in household debt as a percentage of income	The level of household debt as a percentage of income increased from 77% in 1990 to 127% at the end of 2007.
6	**Reduction of the risk premium**	The average difference in mortgage interest rates between subprime and prime mortgages	The average difference in mortgage interest rates between subprime and prime mortgages decreased from 2,8% in 2001 to 1,3% in 2007.
7	**Lowering lending standards**	1. The frequency of loan rejections 2. Loan-to-value ratio 3. Reporting suspicious activity	1. The frequency of loan rejections decreased from 29% in 1998 to 14% in 2002 and 2003. 2. The average loan-to-value ratio for home equity loans was 100% for mortgage loans issued in 2005, 2006 and the first half of 2007. Three years ago, the average subprime borrower made a 10% down payment on a home. 3. According to the Financial Crimes Enforcement Network, the number of reports of suspicious activity increased by 1,411% between 1997 and 2005.
8	**Increase in risky products**	The share of variable rate mortgages in the subprime mortgage	More than 90% of subprime mortgage loans in 2006 were variable rate.

№	Risk factor	Key risk indicator (KRI)	KRI value and its interpretation
		portfolio	
9	**Growth in the volume of subprime mortgage securities**	Volumes of subprime mortgage securities in investment portfolios	Growth of subprime mortgage securities in investment portfolios from 54% in 2001 to 75% in 2006.

Conclusions

The high volatility and dynamism of the macroeconomic environment in recent decades have once again emphasized the critical importance for multinational enterprises (MNE) to have a clear approach to timely managerial response to such changes. As part of the strategic planning processes, modern MNE must identify and assess risks in relation to the key objectives of their strategy and assess the potential change in the risk profile of the enterprise, if there are changes in the strategy and any of its sensitivity to endogenous factors. That is why existing and new risk management strategies should be integrated into the general processes of operational and strategic planning of MNE.

At the same time, an effective system of key risk indicators (KRI) is an important component of an effective risk management strategy of MNE, based on a holistic approach to the organizational structure of MNE and taking into account the geographical, functional, operational specifics of the enterprise's business. MNE strategic planning process can use KRI as input, which should be linked to existing strategic objectives. The trend or level of such KRI should provide a significant positive contribution to the implementation of MNE strategy, and within the portfolio analysis may signal its macroeconomic sensitivity and correlation with exogenous factors.

The analysis of the genesis and consequences of the mortgage crisis and the collapse of the US residential real estate market in 2007 showed the high effectiveness of the practical use of KRI to achieve the goals of MNE and improve the efficiency of business activities, and the timely consideration of a number of risk-creating factors of the crisis, the levels and trends of the relevant KRI would have given all market participants clear signals about its approach.

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