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Dichotomy of value at risk and prudent value concepts in financial risk management

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Abstracts: This paper examines two main paradigms of financial risk management, i.e., Value at Risk and Prudent Value. Analyzed are the historical roots of these key concepts, their foundational principles, the main focus of application, and other particulars. Demonstrated is fundamental trade-off between these key risk metrics in financial management as a balance between market sensitivity and its long-term stability. Underlined is also the key role of these risk measures in international financial regulation, including Basel 3.1 Accord and the European Prudent legislation framework. Particular attention was given to a developed stochastic approach to a determination of extreme assets value evolving over time that includes key parameters needed to describe actual market dynamics. In its core model developed integrates the advantages of Value at Risk and prudent Value methodologies, avoiding their main limitations. The model was verified and tested based on processing vast experimental data on residential property market evolution in Ukraine and the United Kingdom

Keywords: Value at Risk, Mortgage Lending Value, Prudent Value, Financial Risk Management, Key Risk Metrics, Stochastic Mode.

1. Introduction and Overview

Global risks landscape evolution over the last two decades demonstrated a gradual shift from being defined by discrete, episodic disruptions vividly highlighted by the Global Economic Crises 2007/2009 to the state of permanent volatility and the emergence of an "expanding risk zone" that encompasses all five key domains: geopolitical, economic, environmental, technological, and societal. This tendency was clearly emphasized by the recent edition of the World Economic Forum Global Risks Report 2025, based on leading insights on the global risks contemporary palette from over 900 experts across academia, business, government, international organizations, and civil society (*WEF,* 2025:51).

Such a complex picture of different crises categories evolving jointly and characterized by the consolidation of institutional observers in a term a "polycrisis" accentuates a paradigm shift in the world order and leads to greater instability, eroding trust and insecurity, growing fragility that those risks environment generate. Common and often overlapping dynamics of main risks domains triggered by accelerated economic globalization processes complicate further their interrelations and interdependence, leading to a highly volatile and hence risky overall landscape. Exemplification of such general development can be given by recent geoeconomic confrontation, global financial crises, military conflicts in Ukraine, Middle East and Sudan, trade wars, pandemic, climate degradation that resulted in global markets and supply chains disruption, lowering GDP, strain employment, migration amplification necessitating to rethink existing paradigm of risk management to address new more diverse and challenging landscape to secure resilience and shock absorption of economies and societies (*Beasley M.,* et al., 2023:6).

Such an escalating trajectory of the global risk landscape was not evolving unnoticed by researchers and practitioners. Historically conceptual foundations of risk management are deeply rooted in the development of probability theory and the mathematical quantification of uncertainty, starting from the Renaissance era. This evolution can be split into three distinct phases: the establishment of mathematical foundations, the rise of a traditional, fragmented risk management approach, and the emergence of the modern Enterprise Risk Management (ERM) concept (*Bernstein P. L.,* 1998: 8).

The theoretical genesis of risk management started with solving gambling problems by Blaise Pascal and Pierre de Fermat as early as 1654. Over the subsequent centuries, a number of outstanding mathematicians and theorists detailed and refined these tools. Jacob Bernoulli formulated the Law of Large Numbers, providing the bedrock for the insurance industry's ability to predict outcomes across large populations. Abraham de Moivre developed the concepts of normal distribution and standard deviation, which allowed for the measurement of variance and volatility. Thomas Bayes introduced Bayes' Theorem, enabling conditional probability assessments where risk estimates are updated as new information arrives—a concept central to modern iterative risk processes.

In the middle of the 20th century, these mathematical concepts gradually transformed into the business domain. Harry Markowitz's development of Modern Portfolio Theory emphasized the diversification of risks, while John von Neumann and Stanisław Ulam developed game theory and the Monte Carlo method, respectively, providing the computational tools for simulating complex risk scenarios (*Crouhy M. et al*, 2023: 20).

Despite these advances, enlarged by several other milestones including a seminal book published in 1963 by R. Mehr and B. Hedges and titled "Risk Management in the Business Enterprise" with a proposed five-step risk management process: identification, measurement, assessment, response selection, and monitoring, the 1970s and 1980s could be defined by fragmented approaches. At the institutional level, financial risk was managed by treasury departments using derivatives and the Black-Scholes model, operational risk was the domain of plant managers, and legal risks were managed by general counsel. These disconnected and fragmented approaches led to vulnerabilities, creating unnecessary borders inside of the organization when interdependent risks were often omitted.

The growing need for a more holistic approach and its regulatory basis became evident in the early 1990s, which led to the appearance of two main risk management frameworks. Following several corporate catastrophes like the collapse of Enron and the implementation of the Sarbanes-Oxley Act (SOX) the Committee of Sponsoring Organizations of the Treadway Commission (COSO) released in 2004 first edition of framework and guidelines titled "Enterprise Risk Management—Integrating with Strategy and Performance" being updated essentially in 2017 which explicitly linked corporate risk management with strategic-planning process (*COSO,* 2017:15).

It was followed by more global initiatives of the International Standards Organization (ISO) in developing and introducing in 2009 the first edition of ISO 31000 standard titled "Risk Management – Guidelines", updated in 2018, and extended to ISO 31000 high-level family standards universally applicable for any organization regardless of type, size, sector or context (*ISO*, 2018: 18).

While both methodological frameworks aim to provide a structured approach to identifying, assessing, and managing risk environments, they diverge significantly in their philosophical origins, complexity, and application.

ISO 31000 standards are designed as a streamlined, high-level general guide that prioritizes flexibility and strategic agility of risk management system with focus on organizations that need a "risk-first" approach where the process can be adapted rapidly to changing market conditions (*Rushkovskiy M.,* et al, 2025: 44). In contrast, COSO ERM is more comprehensive, detailed and prescriptive methodology deeply rooted in accounting and auditing expertise. Because of that, it is often preferred by organizations under heavy regulatory pressure, such as those in banking, insurance, and healthcare, who require detailed documentation and clear accountability structures (*Crouhy M.,* 2023: 20).

The development of these key risk management strategic frameworks that create a platform for organizations to systematically identify adverse factors and mitigate their possible negative consequences was accompanied by the quest for processes of scientifically grounded criteria of accepted risk level. This tendency, being strongly triggered by practical needs, became especially evident in the last decades in the financial domain as a cornerstone of economic stability.

It resulted in appearance of two different philosophies of financial risk limitations: Value at Risk (VaR) concept as dynamic, market-sensitive quantification of potential loss and Prudent Value approach representing conservative, structural assessment of assets long-term sustainable value (*Coleman T.,* 2012: 12). Given the difference in origin, initial purpose and area of application as well as foundational background and structure it seems reasonable to provide comparative analysis of these methodologies particulars to get more clear vision on prospects of their further development and practical implementation in the financial risk management perspective. This statement represents the **main focus** of the study and its key objective, which is reinforced by the gradual inclusion of both metrics in the global, regional, and national regulatory framework of the financial sector through implementation of Basel Accord (II, III) guidelines, EU Directives and Regulations, and respective national standards as disclosed below.

2. Literature review

The historical trajectory of the Value at Risk concept began long before the term appeared in the 1990s. Its origins can be traced back to early 20th-century capital requirements for U.S. securities firms (*Damodaran A.,* 2005:21). In 1922, the New York Stock Exchange (NYSE) for the first time implemented an informal capital test, which by 1929 had evolved into a structured system of requirements: 10% on proprietary holdings in government bonds, 30% on other liquid securities, and 100% on illiquid assets (*Holton G.A.,* 2013: 28). These so called "haircuts" were the predecessors to modern risk-weighted assets approach, representing a rudimentary attempt to link capital requirements to the potential for market loss.

With the collapse of the Bretton Woods system in the 1970s and the emergence of derivative instruments markets demonstrated unprecedented volatility. To regulate the situation the Securities and Exchange Commission (SEC) in 1975 promulgated the Uniform Net Capital Rule (UNCR), which categorized financial assets into twelve classes (*Damodaran A.,* 2005:21, *Holton G. A*., 2013: 28). By 1980, the SEC began tying capital requirements to a statistical 95-quantile of potential losses over a 30-day interval, effectively implementing the first regulatory Value at Risk as a statistically based metric. Throughout the 1980s, several financial institutions like Bankers Trust developed sophisticated internal models to manage fixed income portfolios, focusing on the covariance of bond yields across maturities.

As the risk metrics Value at Risk model emerged in 1989, when J.P. Morgan owner, Dennis Weatherstone, asked for a report that would measure in detail the financial risk of his company. In 1992, after an exhaustive study, the company published the RiskMetrics methodology as a response to the increasing volatility of trading books and the need for a unified metric to aggregate market risks across diverse asset classes. (*Cortes G.C.,* 2022: 14).

Basically, VaR was defined as the maximum amount expected to be lost over a specified time horizon with the pre-defined confidence level (*Jorion P.,* 2001: 32). So, VaR metric estimation is based on three key parameters: financial indicator distribution, time horizon, and confidence level. Financial indicator used is usually a type of currency with time horizon being related to days or few weeks and confidence level normally within the range 1% - 5 % (*Abad P., et al,* 2014: 1). In statistical terms, VaR acts as a certain quantile of the probability distribution of assets portfolio returns, hence representing statistical measure of potential loss. In this sense, as a theoretical concept, VaR is fundamentally rooted in Markowitz portfolio theory that directly links risk measure with market volatility parameters (*Rafni, T., & Agustina, D.,* 2025: 41).

Estimating Value at Risk requires a rigorous statistical process to determine the probability distribution of returns. Three primary methodologies dominate in this field: the historical method, the variance-covariance (parametric) method, and Monte Carlo simulations (*Manganelli S., Engle R.F.,* 2001: 33).

In support of RiskMetrics broader implementation J.P.Morgan provided free access to the underlying volatility and correlation data necessary for calculating VaR across major markets. Jointly with clearness and general simplicity of the VaR as a risk level metric, it effectively catalyzed quick penetration and adoption of this approach in the financial industry. That was cemented by the Basel Committee on Banking Supervision (BCBS) incorporation of the concept into the 1996 Amendment to the Basel I Accord, allowing banks to use internal VaR models for market risk capital requirements (*Damodaran A.,* 2005:21).

Such a BCBS position led to the appearance of several VaR methodologies developed internally by financial establishments, including their intention to minimize weaknesses inherent to this approach in response to criticism of its background (*Holton G. A.,* 2013: 28).

Most prevailing types of VaR models are those (*Abad P., et al*, 2014: 1):

- **historical VaR**, which is based on actual historical return data to simulate potential future losses being advantageous because it reflects real market behavior, but also inherently limited by the quality and duration of historical data used and future market evolution forecast.
- **parametric VaR**, often associated with the variance-covariance approach, relies on statistical parameters such as mean returns and standard deviations to estimate potential losses being particularly useful for portfolios with normally distributed returns.
- **Monte Carlo simulation VaR,** which offers greater flexibility by allowing for the incorporation of various distributions and correlations among assets, providing a more nuanced understanding of risk exposure, but requiring more complex calculational efforts.

Existence of several established methodologies lead to fundamental challenge related to the fact that their application often generate differing VaR figures for the same portfolio (*Holton G. A.*, 2013: 28) . Moreover, despite its practical advantages, Value at Risk is subject to severe statistical and economic criticisms, most of which center on its inability to handle extreme events and its lack of mathematical consistency (*Taleb N. N.,* 2007: 48, *Einhorn D.,* 2008: 24).

The most significant and frequently ignored limitation of VaR is its failure to quantify the maximum potential loss above the specified confidence percentile. A VaR figure provides no insight into the size of the loss that occurs when this threshold is exceeded—so called *tail effect*. This statistical blindness leads to a dangerous sense of security (*Novak, S.Y.,* 2011: 37).

Such skepticism particularly grew after the Global Economic Crisis 2007/2009, based on VaR inability to safeguard the financial establishments from such severe consequences caused by the failure to capture critical systemic and extreme tail risks (*Nocera J.,* Jan. 4, 2009: 35). It led to the development of several more advanced and coherent methodologies within the VaR general concept. They include Conditional Value at Risk (CVaR) that focus on the average loss beyond the traditional VaR metrics (*Hopkin P.,* 2018: 29), Entropic Value at Risk (EVaR) which can be treated as upper bound of VaR (*Amir A. J.*, 2012: 3), Range Value at Risk (RVaR), a robust modification of CVaR (*Cont R. et al.*, 2010: 13), Expected Shortfalls (ES), accounting for severity of losses at distribution tails (*Barczy, M., et al.,* 2022: 5).

With all these modifications, despite limitations rooted in mathematical incoherence and failure to quantify losses beyond the confidence threshold Value at Risk concept is playing a cornerstone role in portfolio risk management and helping financial institutions and investors in general to measure and manage maximum losses expected (*Roncalli Th.,* 2020: 43, *Holton G. A.*, 2013: 28).

While VaR is a statistical metric of short-term potential loss, the Prudent Value concept grew on a safety principle, prioritizing the long-term, permanent features of a property over its immediate market price and thus playing the role of market volatility safeguard. The main concern to correct the property market value for investments and other types of long-term purposes is related to the value stochastic evolution over time. Based on that Prudent Value concept and other key approaches of a similar type could be called under the generic heading of Long-Term Value (LTV) family methodologies (*Crosby N., Hordijk A.,* 2023: 19).

Evolving in parallel to the mathematical rise of VaR metric, the concept of Prudent Value followed a separate, century-long evolution in Continental Europe, particularly starting within the German Pfandbrief tradition of Mortgage Landing Value (MLV) estimation for collateral purposes (*VDP,* 2026: 50). The MLV concept was included in the German Mortgage Banking Act (Hypothekenbankengesetz) of 1900 and was designed to provide security for covered bond investors by ensuring that the collateral value is linked not to property current market value but more to realization value reflecting time effect. For over a century, this concept has remained a national hallmark of the German financial system, contributing to the historical stability of its real estate market.

Being most well established, this approach came into force in 2005 through the adoption of the German Pfandbrief Act that regulates the determination of the Mortgage Lending Value (*BelWertV*) playing central role in the property valuation for lending purposes in Germany (*Grimman,* 2017: 27). To some extent MLV concept is followed with minor modifications by several other European countries including Austria, Czechia, Hungary, Luxemburg, Poland, Slovenia and Spain (*RICS,* 2018: 42).

The definition of the Mortgage Lending Value is set out in the EU Capital Requirements Regulation (CRR) No.575/2013 as “the value of immovable property as determined by a prudent assessment of the future marketability of the property taking into account long-term sustainable aspects of the property, the normal and local market conditions, the current use and alternative appropriate uses of the property” (*EUR,* 2013: 25). From this appears that methodology is grounded to be anti-cyclical hence MLV should not rise as rapidly as market values during bubbles, nor should it collapse as sharply during crashes.

In its foundation MLV model is principle based that led to variation of concept application in different jurisdictions (*Crosby N., Hordijk A.,* 2021: 18). Diversity of this model application in different countries creates concerns of a comparative nature and calls for a unified approach.

In a general sense, property MLV estimation should be based on current transaction databases available, accompanied by a broader historic analysis and reasonable forecast to arrive to the “prudent” sustainable value that ignores short-term price volatility to arrive to a realistic lowest possible level of property value, which is expected in a future time horizon under consideration.

A different view on Long-Term Value estimation was argued by Nordlund (*Nordlund B.,* 2008:36) and Cardozo (*Cardozo C.,* et al, 2017:11) that have been named as “reference value model” and “adjusted market value-AMV”, respectively. They are also grounded on the previous statistical data through the identification of long-term trends, assuming that the future would look like the past. The Main distinctive feature of these approaches is the smoothing property market value local volatility through “averaging” the general trend rather than focusing on the estimation of long-term conservative value in the original MLV concept. In more recent version of AMV-approach property current market value should be compared with long-term trend line as reflected in an appropriate capital value index evolution *(Cardozo C., et al,* 2017:11). Further advancements of AVM type models include some consideration of trend evolution with forecast of its pattern in coming years that is mainly based on conventional discounted cash flow (DCF) techniques (*Burston B., Burrel C.*, 2015:10, *Crosby N., Hughes A*, 2011:17).

Referring to cyclical mode of value change evolution two main concepts of LTV effect consideration have been identified in summarizing report prepared by working group set up by leading international valuation organizations (*Crosby N., Hordijk A.,* 2021: 18). The first one is “through-the-cycle” type which averages or “flattens” the value pattern fluctuations over time, aiming to identify a long-term equilibrium value (Fig.1). The second one is “under-the-cycle” concept which intends to find lower “skirting” line of market value fluctuation over a given period of time. Hence, this type of methodologies are more in line with established Basel 3.1 and CRR3 requirements to implement prudent assessment of asset value with respect to a long-term effect.

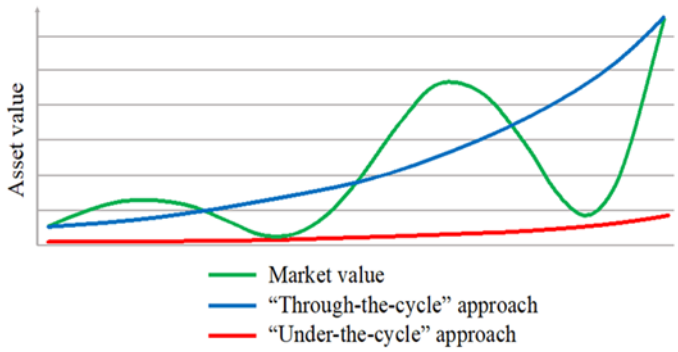

Fig. 1. Stylized presentation of "through-the-cycle" and "under-the-cycle" approaches of long-term value estimation**.**

Source: Crosby N., et al, 2021: 18

Based on the main disputable argument that "it is virtually impossible to construct a robust, consistent prudent valuation regime at the level of the individual property", it's also proposed to rely on a combination of market value supplemented by a through-the-cycle long-term value to provide market adjustment (*Crosby N., Hordijk A.,* 2023: 19).

In a more structured format, this approach of prudent value estimation is enforced by the EBA Regulatory Technical Standard (*EBA*, 2020: 22) applicable to financial instruments with deduction of Additional Valuation Adjustments (AVAs) from the Common Equity Tier One (CET1) capital.

One of the main commonalities of all long-term "prudent" value estimation methodologies, based both on "through-the-cycle" and "under-the-cycle" concepts are their schematization of value evolution pattern over time, as demonstrated by fig.1, when assets market or fair value should be corrected to reach its long-term "prudent" value by deduction of certain adjustments. Such adjustments are not analytically and statistically grounded at the individual property level, being mainly based on the real property segments' value general trend over time.

The need for more analytically grounded developments in this sense was strongly underlined by the international group of experts representing most recognized international valuation professional bodies (*Crosby N., Hordijk A,* 2021: 18). To compensate to some extent this existing gap stochastic analytical model of assessing time effect in valuation and estimating long-term "prudent" value was developed being successfully tested based on residential property data base (*Yakubovsky V.,* et al, 2022: 52). The model has been generalized further on with direct analytical reflection of time horizon role in "prudent" and "cap" value estimation *(Yakubovsky V., Zhuk K.,* 2025: 53).

Developed methodology is grounded on the theory of stochastic processes with application for solving practical needs of reliable estimation of both lower bound or "prudent" and upper bound or "cap" assets value. In this sense, the problem of estimating the extremes of stochastically progressing value was represented as an analytical task of finding the upper or lower border of this randomly evolving process that will not be reached with a given level of probability during the period of time specified.

With such a broad spectrum of existing models in these two mainstreams of financial risk management metrics, i.e., Value at Risk and Prudent Value, it's essential to provide a comparative analysis of their main fundamentals and particulars with distinctive accentuation of prospects for unified approach developments.

3. Results and discussion

While both these key risk management concepts serve the same main aim to safeguard the solvency of financial institutions and to strengthen through that resilience and improve transparency of financial systems in general, they emerged in different ways and are based on quite distinctive foundations. With all modifications and extensions available, including methodologies developed for metric estimation in its core VaR concept is fundamentally based on probability theory with further involvement of portfolio analysis for multi-assets application and aggregation (*Jorion P.,* 2006: 32).

In the most general form, VaR can be derived from the probability distribution of future assets or portfolio value as a threshold for the given confidence level *c* (Fig.2).

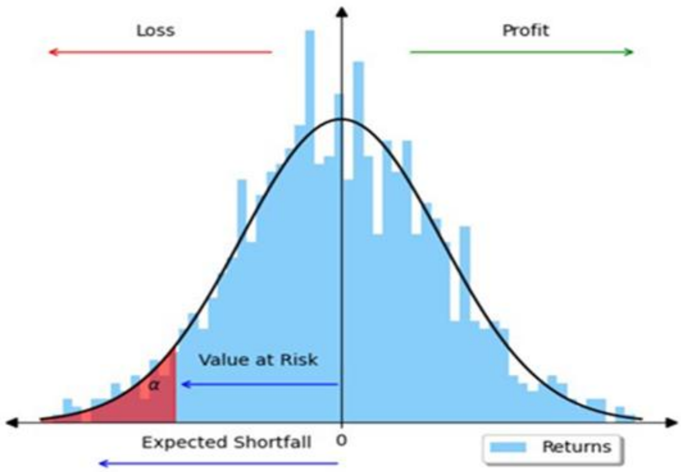

Fig.2. Schematic view of VaR concept for Stock Returns.
Source: *adapted from: Franco M. F, et al, 2023: 26.*

As such VaR can be interpreted as certain c-quantile of the assets or portfolio value $v*$ probability distribution with the given general equation for the left distribution tail:

$$1 - c = \int_{-\infty}^{v*} f(v)dv = p, \quad (1)$$

where p is the probability level for the value lower than $v*$.

In such a generalized form, equation (1) is valid for any type of value probability distribution. So, in practice general task is to estimate this pre-defined c-quantile of assets probability distribution for the given confidence level *c* based on any trustworthy methodologies developed.

The historical method is perhaps the most straightforward, as it uses actual price movements from a historical period, typically up to 1,000 trading days (*Abad P. et al.,* 2014: 1). It makes no assumptions about the normality of the distribution, capturing the actual "fat tails" observed in the data that constitutes the primary strength of this method. However, being based on historical data, it is entirely backward-looking, assuming that the future will be the same as the past. But with market evolution selected historical frame data will not reflect the new risk environment until those events are incorporated into the data set used (*Saputra D. et al.*, 2023: 45).

Alternatively, the variance-covariance or parametric method, in contrast, assumes that returns follow a normal distribution. It calculates VaR using the mean, the standard deviation and a standardized for normal distribution z-score parameter corresponding to the confidence level specified (*Shayya R., et al*., 2023: 46). While computationally efficient, this method is often criticized for underestimating risk during crises because it ignores the non-linearities of assets and the reality that financial markets do not always follow normal distributions.

Monte Carlo simulations are the most flexible and computationally intensive, using stochastic models to generate multiple potential market scenarios. This method is essential for portfolios with complex options and non-linear exposures where simpler methods fail. While being highly flexible Monte Carlo models are susceptible to "model risk" with chosen stochastic process or its parameters ability to reflect actual dynamics of the market (*Saputra D. et al.*, 2023: 45). The key constraint of the method, however, is its significant requirement for computational resources and time to achieve reliable results requiring considerable investments in both sophisticated system and users professionalism. With several advantages of the VaR concept, including its ability to capture in one parameter the overall complex market risk landscape, it suffers from several drawbacks. A core theoretical criticism of VaR is its general failure to satisfy the required risk measure coherence and, more particularly, the subadditivity principle. This means that the VaR of a portfolio may, in certain circumstances, be greater than the sum of separate assets VaRs in the portfolio (*Marcoption,* 2023: 34). But this property is essential because it fundamentally supports the portfolio diversification principle.

Another essential VaR critical constraint is rooted in its mathematical definition, with the failure to quantify losses beyond the confidence threshold leaving it blind to catastrophic tail risks that was dramatically exposed during the 2007-2009 financial crisis.

These main shortcomings inherent to the VaR basic concept led to several further methodological modifications mentioned above. However, with several different methodologies developed to estimate VaR metric in general, they integrate three core parameters: the time horizon or holding period, typically 1-10 banking days, the confidence level, usually 95 % or 99 %, and the distribution parameter of potential losses, most commonly expressed in monetary units. As a primary metric for market risk in trading books, it represents a point-in-time statistical estimation of what a financial institution could lose over a short time horizon under normal market conditions.

It should be noted also that, actually, by estimating the VaR metric denoted below as V_c, we are shifting from assets mean value V_m that corresponds for symmetric distributions to 50 % c- quantile to its stipulated level. Hence, as a statistical measure, V_c or VaR metric is determined as (Fig.2):

$$Vc = Vm - \Delta_c, \quad (2)$$

where the correction parameter Δ_c for the given probability distribution function depends on the confidence level c needed.

In contrast to a statistically grounded point-in-time VaR metric, MLV or in a broader sense Prudent Value concept, is oriented on the safety principle with long-term market behavior consideration, neglecting its local fluctuations and speculative bubbles. In fact it prioritizes assets value estimation that can be expected in the event of the sale in any point over the investment period or loan duration (Fig.1). While Value at Risk as a measurable risk factor conceptually is market volatility reactive Prudent Value is not of such type treating short-term market jumps and falls as a “noise” that should be excluded from consideration.

Unlike Market Value, which can be verified against actual transactions, the main models of Prudent Value are estimates based on regulatory requirements or a valuer's judgment of the "long-term" market behavior, suffering from limited theoretical and statistical ground. With reference to these main drawbacks, the concept of Prudent Value is often criticized for being subjective and opaque (*IVSC*, 2025: 31). This lack of a clear, observable foundation can make the Prudent Value metric also difficult to audit and can lead to inconsistencies in application across different jurisdictions.

These main concerns was strongly highlighted by international financial circles in response to the European Banking Administration (EBA) draft standards on prudent valuation (*AFME,* 2013: 2). Financial sector groups including ISDA, AFME, BBA expressed their preference to "non-formulaic benchmark" of 80% to 85% confidence level, roughly equivalent to one standard deviation, which they believed are more prudent and less procyclical than a 95% threshold proposed in the EBA standard for this metric estimation.

From this point of view, it underlines the schematization view and expert opinion principle used as a basic one when establishing the Prudent Value metric, with a lack of data-driven and theoretically proven basis.

Main distinguishing particulars of these two key paradigms of financial risk management are captured in Table 1 below, emphasizing basic differences of concepts employed. With all essential dissimilarities inherent to VaR and Prudent Value concepts, estimation of an appropriate metric in case of long-term assets value concept requires correction of their current market value V_m to be made in line with the market evolution forecast. In most clear form this is stated in the EBA's Prudent Valuation framework with requirement to financial institutions "… to deduct Additional Adjustments (AVAs) from their Common Equity Tier 1 (CET1) capital (*EBA*, 2024: 32)". At the same time such deductable adjustments are neither analytically nor statistically grounded being mainly based on expert's opinion with overall real property value evolution tendencies over time.

Table 1. VaR and Prudent Value/MLV concepts comparison*

Methodology feature	VaR	Prudent Value
Theoretical basis	Theory of Probability, Portfolio Analysis	Value evolution schematization, expert opinion
Primary objective	Maximum probable loss	Long-term realizable value
Data input	Recent historical market data	Long-term trend data
Time horizon	Short-term (1-10 days)	Long-term (years)
Risk focus	Volatility of returns	Exit price prudent estimation
Market sensitivity	High, Captures daily volatility	Low, Excludes speculative elements
Primary assumptions	Future volatility resembles the past	Sustainable market parameters define long-term value
Risk key application	Market risk	Credit risk
Cycle treatment	Cycles reflecting	Cycles neglecting

Source: *author's own creation.*

Regarding mentioned above to estimate Prudent Value $V_{pr,}$ we arrive at a general formula similar to (2):

$$Vpr = Vm - \Delta pr \, , \tag{3}$$

where the correction parameter Δ_{pr} is subject of determination based on the MLV or Prudent Value model selected.

Formal resemblance of equations (2) and (3) should not be treated wrongly. Correcting parameters Δ_c in (2) and Δ_{pr} in (3), respectively, are of a different nature. To find out maximum acceptable loss in assets value adjustment Δ_c is focused on estimation of c-quantile of short-term value distribution (Fig.2) when Δ_{pr} is oriented to correct current assets market value to determine its long-term "skirting floor" neglecting possible speculative bubbles and local market fluctuations (Fig.1). In particular, it means that being based on averaged and aggregated data parameter Δ_{pr} does not reflect local market stochastic volatility. Hence, additional adjustment is needed to get assets' long-term Prudent Value metric with a sufficient level of confidence.

Different and more universal approach to estimate assets long-term Prudent Value is grounded on direct analysis of market value evolution as stochastic processes (Fig.3).

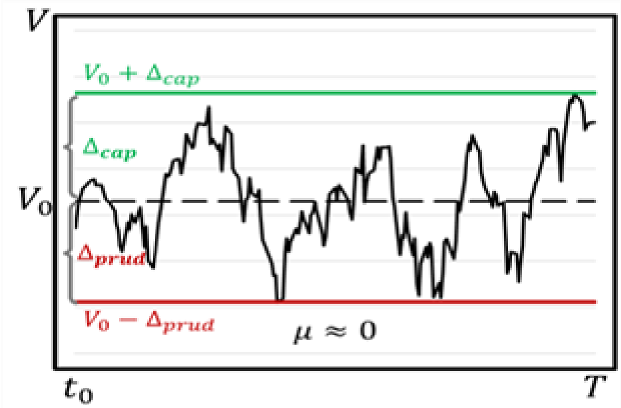

Fig. 3. Schematic presentation of long-term “prudent” and “cap” value estimation for stagnating (μ~0) markets**.**

Source: *Author's creation.*

With such approach the problem of assessment low or upper extremes of market value dynamics over any given period of time is reduced to analytical task of finding upper or lower boundary of this randomly evolving process that will not be reached with specified level of probability during the period of time required. In this case upper boundary represents the assets' “cap” value, while the lower one corresponds to the “prudent” value.

Based on Samuelson's Rational Theory of Warrant pricing in notations given by Shiryaev (*Shiryev et al,* 1995:47) stochastic evolution of the asset value V_t can be described by the following equation of diffusion type:

$$V_t = V_0\, exp\left\{\left(\mu - \frac{\sigma^2}{2}\right) t + \sigma W_t\right\},\ t \geq 0. \quad (4)$$

Here, $V_0 > 0$ is asset value at $t = 0$ point of time being nonrandom and known, $\mu \in R$ is growth factor, $\sigma > 0$ is process volatility, and W_t is a Wiener process with continuous paths.

Analytical solution for correction parameter $\Delta_{t,p,pr}$ to estimate low boundary of asset value V_t over given period of time t with confidence level p is given as:

$$\Delta_{t,p,pr} = V_0(1 - exp^{x_p}), \quad (5)$$

Notion x_p in (5) stands for a parameter that reflect stochastic behavior of the property market value evolution, subject of determination based on assets data available with its forecast (*Yakubovsky V.V. et al,* 2022: 52). Finally, for the asset value stochastic process evolution, lower or “prudent” $V_{t,p,pr}$ magnitude can be estimated as:

$$V_{t,p,pr} = V_0 - \Delta_{t,p,prud} = V_0 - V_0(1 - exp^{x_p}). \quad (6).$$

Equation (6) gives a final version of asset lower $V_{t,p,pr}$ bound value estimation with correction parameter $\Delta_{t,p,pr}$ for the asset with initial market value V_0, given level of probability p and assets market value stochastic evolution parameters σ, μ encompassed by parameter x_p. Similar model was developed on the same theoretical basis for estimation of upper or “cap” value extreme of assets market value evolution over given period of time.

This model was further extended to reflect directly time horizon factor in assessing extreme boundaries of assets stochastically evolving value (*Yakubovsky V. V., Zhuk K.O.,* 2025: 53). Essentially assets stochastic evolution in accordance with (4) depends on three key parameters:

process "randomness" determined by coefficient of volatility through dispersion σ, general tendency coefficient μ and process duration t.

Rewriting equation (4) in terms of log-values, we obtain:

$$V_t = V_0 + at + \sigma W_t, \qquad t \geq 0 \qquad (7)$$

where: $a = \mu - \sigma^2/2, \qquad t \geq 0$.

In a more general form, equation (7) can be given as:

$$V_t = V_0 + \Delta_{d,pr} + \Delta_{s,pr} = V_0 + \Delta_{t,pr} ,$$

where

$$\Delta_{t,pr} = \Delta_{d,pr} + \Delta_{s,pr} . \qquad (8)$$

Such interpretation and split of the general correction parameter $\Delta_{t,pr}$ into 2 main components, i.e. deterministic and stochastic that depend mainly from process duration $\Delta_{d,pr}$ and its volatility $\Delta_{s,pr}$, respectively, can be accepted for stationary stochastic processes with $\sigma W_t \simeq$ Const. It also gave a possibility to separate the role of these two main components, i.e., time horizon and local volatility, on adjustments needed to reach assets prudent value.

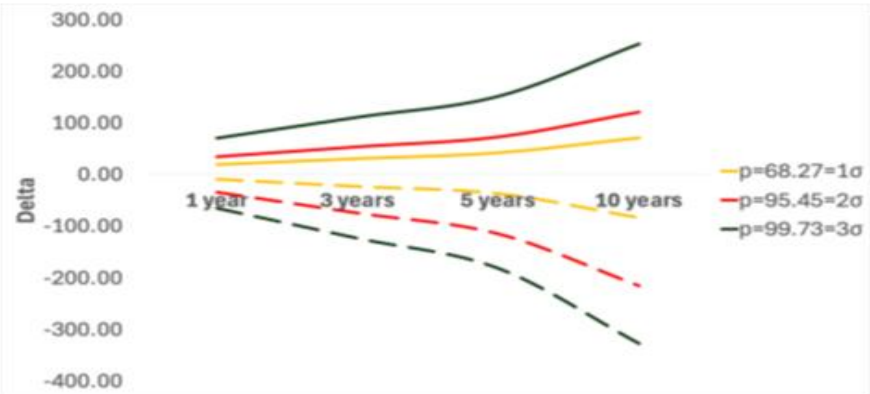

Fig.4. Dependence of adjustment factors $\Delta_{d,p,cap}$, $\Delta_{d,p,pr}$ on time horizon t at different confidence levels p for residential property value (flats) of 1 sq. m. in Ukraine.

Source: *adapted from (Yakubovsky V. V., Zhuk K.O., 2025: 53).*

As an example, dependence of correction parameter $\Delta_{t,pr}$ on time horizon t for different confidence level *p=68.27 %; 95.45%; 99.73 %* is demonstrated by Fig. 4 simultaneously with correction parameter $\Delta_{t,cap}$ for upper or "cap" extreme boundary for Ukrainian residential property market.

A stochastic model developed for the estimation of asset value low or "prudent" and upper or "cap" boundaries, was verified and tested based on impressive statistical data sets of residential property markets' evolution in Ukraine and the United Kingdom. Such selection of data sets was taken intentionally because they represent contrasting national economies: still in the process of development in the Ukrainian case, with well established British market.

To get a feeling of the level of adjustments $\Delta_{t,pr}$ Table 2 compares its results for British and Ukrainian residential property markets. For proper comparison general market growth parameter in both cases was taken as $\mu = 0$.

Table 2. Prudent value adjustment $\Delta_{p,pr}$ in % of property market value V_0 for Ukraine and UK (growth factor μ≃0).

Assets type	"Prudent" adjustment $\Delta_{p,pr}$		
	1 σ = 68.27%	**2 σ = 95.45%**	**3 σ = 99.73%**
Ukrainian residential property market			
Flats	1.01	2.20	3.34
Houses	3.76	5.26	6.18
Land	3.48	4.97	5.53
British residential property market			
Flats	0.52	1.74	2.54
Houses	0.23	0.85	0.53

For well established British residential property market, prudent correction parameter $\Delta_{p,pr}$ is noticeably lower than for the Ukrainian one. Based on the summarized results collected, as an overall estimation, with a confidence level not less than 95 % and project duration up to 5 years, it is recommended for the countries with developed economies to apply adjustment parameter $\Delta_{p,pr}$ within the range of 1-2 % of property market value. For developing countries with greater market volatility sufficient range of these adjustment parameters should be increased to 5-6 % of property market value for the same confidence level (table 2).

Extensive calculations provided based on the developed methodology gave the possibility to create multi-factor regression models for adjustment parameter $\Delta_{p,pr}$ estimation that embrace the role of all most important variables. They include: property market value general trend μ, its volatility degree σ, confidence level required p, and time horizon t needed for all types of residential property analyzed.

Resulted regression type equation received for lower or "prudent" value adjustment parameter $\Delta_{t,p,pr}$ is follows:

$$\Delta_{t,p,pr} = 2844.88 * \sigma^2 - 153.85 * \mu - 0.96 * t - 1.79 * p - 204.63 \quad (9)$$

Model have been validated and showed statistically significant relationships between the adjustment parameter $\Delta_{t,p,pr}$ and its predictors being confirmed by F-criteria values and high significance levels of results estimated based on generalized equation (9) proposed.

It should be emphasized that summarizing equation (9) embraces different types of residential property operating it quite different markets. Two critically influential factors in the adjustment parameter to determine a property's "prudent" value are reflected by the volatility parameters magnitude *(σ)* and general market trend *(μ)*. The rest of the most important parameters, including time horizon needed (*t*) and confidence level (*p*), are subject to analysis objectives. In this sense equations (9) could be treated as generalized one for more broader area of application for estimation of assets "prudent" value.

From this point of view stochastic approach developed could be considered as more versatile, with the potential to unite the Value at Risk concept with the Prudent Value one. Such potential is grounded on the fact that, in its core stochastic approach reflects both assets value volatility metric expressed by dispersion σ^2 and the long-term process evolution through its duration t with a general tendency characterized by parameter μ. For instance, minimizing parameter t in (9) to the level needed for pure VaR metric, we arrive to its estimation with the confidence p needed for the assets volatility measure σ^2 estimated. With regard to short-term timing in this case general evolution trend factor μ in (9) can be taken close to 0.

Regarding discussed above, it should also be noted that the stochastically based approach developed satisfies the basic requirements of Basel 3.1 Accord and the European regulatory framework established both for VaR and Prudent Value estimation, which exhibit two mainstreams in contemporary financial risk management. Such a statement is based on the fact that in its final version, this approach heavily embeds stochastic analysis necessary for VaR measure and employ safety principle for long-term Prudent Value estimation.

4. Concluding remarks

The comparative overview of two main paradigms of modern financial risk management concepts, i.e., Value at Risk and Prudent Value, reveals a fundamental trade-off between market sensitivity and stability, respectively represented by these two methodologies. The conceptual divergence between them is rooted in their temporal orientation and treatment of market long-term evolution to safeguard its efficiency. In this sense developed stochastic approach demonstrated more versatile potential based on the following main advantages:

-solid analytical background, avoiding property value stochastic evolution redundant schematization;

-essential parameters covered by the model reflect both sides of asset markets' evolution, including local sensitivity through volatility level and long-term stability based on the extreme boundary concept followed;

-multi-factor regression equation proposed includes key market particulars, i.e., property general market trend, its volatility level, time horizon needed, and confidence level required;

- the role of these key predictors in asset prudent value adjustments is defined based on the processing of long-term data sets across different types of residential property markets operating in contrasting economies;

- main model concept secures utilization of market value notion, adding analytically grounded adjustments on the basis of actual data of value change stochasticity analysis;

- developed model satisfies the main recent requirements set by international financial institutions and regulators in financial risk management.

Generalized multi-factor regression type equations received based on conducted detailed analysis and generalization, open an opportunity for their broader implementation with respect to other markets and property types for estimation of safeguarding measures in financial risk management application with regard to markets' stochastic evolution over time.

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