



# Portfolio Advice: Portfolio diversification and the impact on investor communication

# Content

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- Diversification – A first approach
- Diversification in quantitative portfolio analysis
- Diversification and information theory
- Diversification and asset allocations
- Examples

# Diversification: A Rule How to Put Eggs in Baskets?

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# Diversification: a Formal Definition

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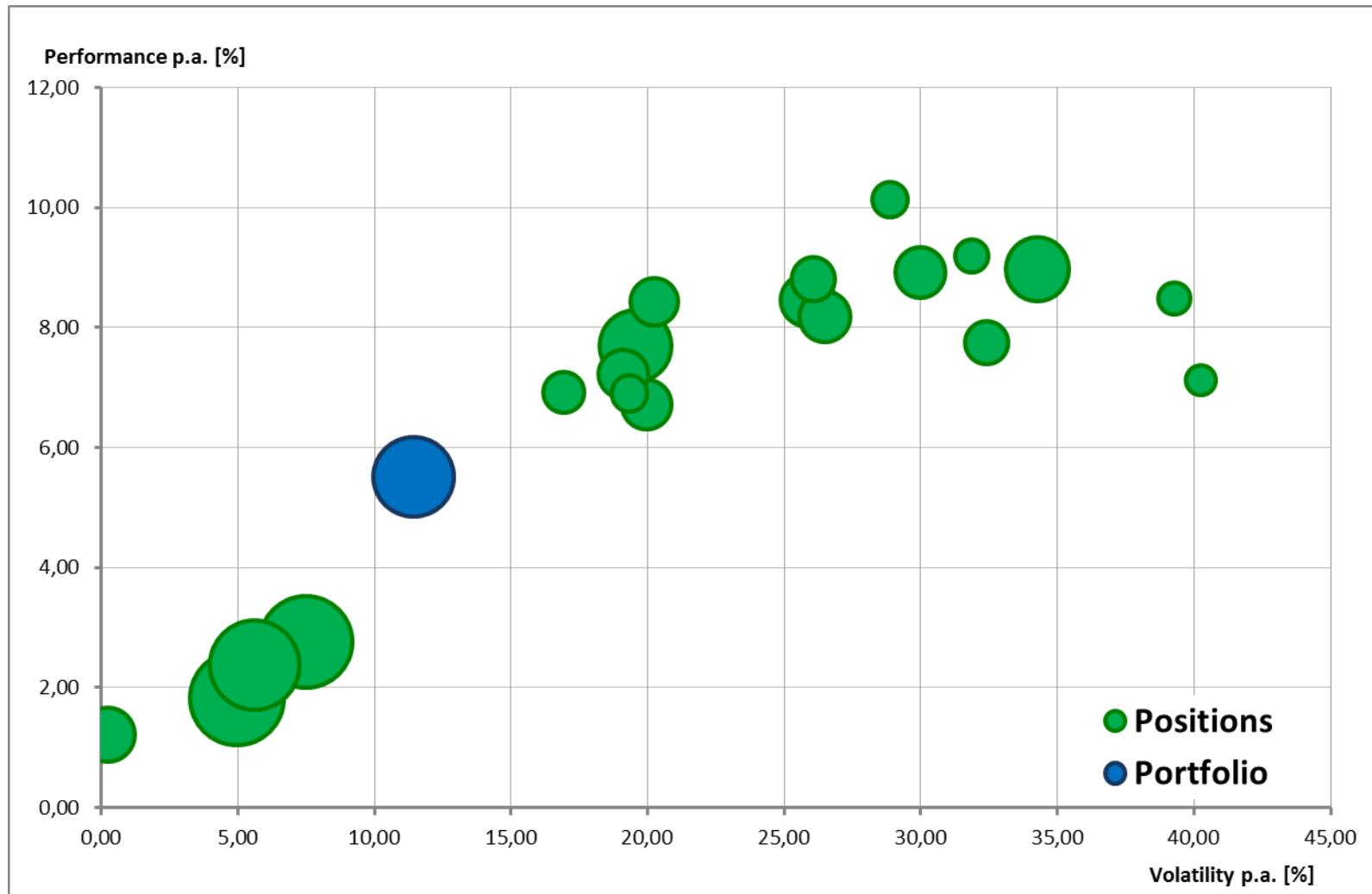
**Diversification  
means reducing non-systematic risk  
by investing in a variety of assets**

# Applying the Concept of Diversification in Investment Advice

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- What is a general measure for the diversification of a portfolio?
- A general measure should work independent of a specific investment strategy
- In other words: We are looking for an absolute measure.

# Diversification and Quantitative Portfolio Analysis I



# Diversification and Quantitative Portfolio Analysis II

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Portfolio risk:

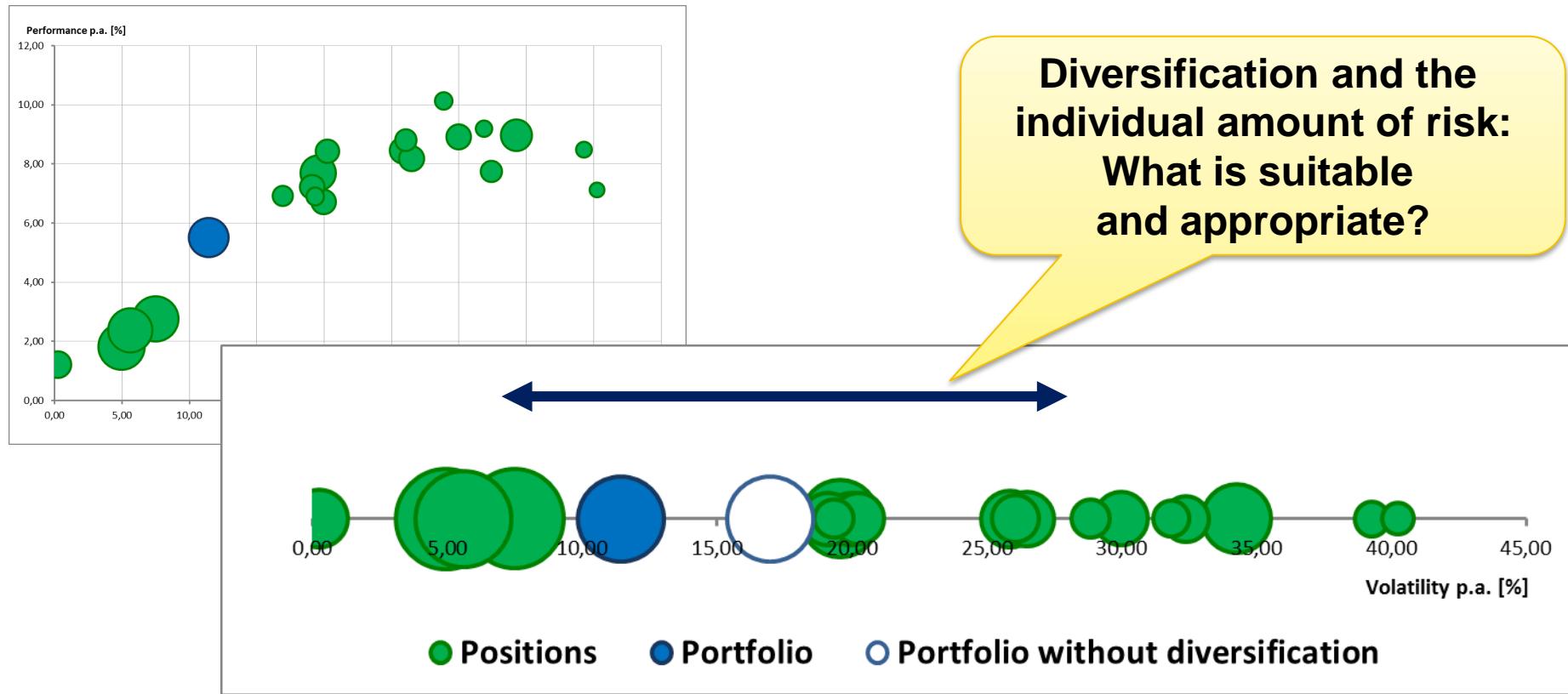
$$\sigma_p = \sqrt{\sum_i \sum_j w_i \cdot w_j \cdot \sigma_i \cdot \sigma_j \cdot \rho_{i,j}}$$

Weighted average risk of positions:

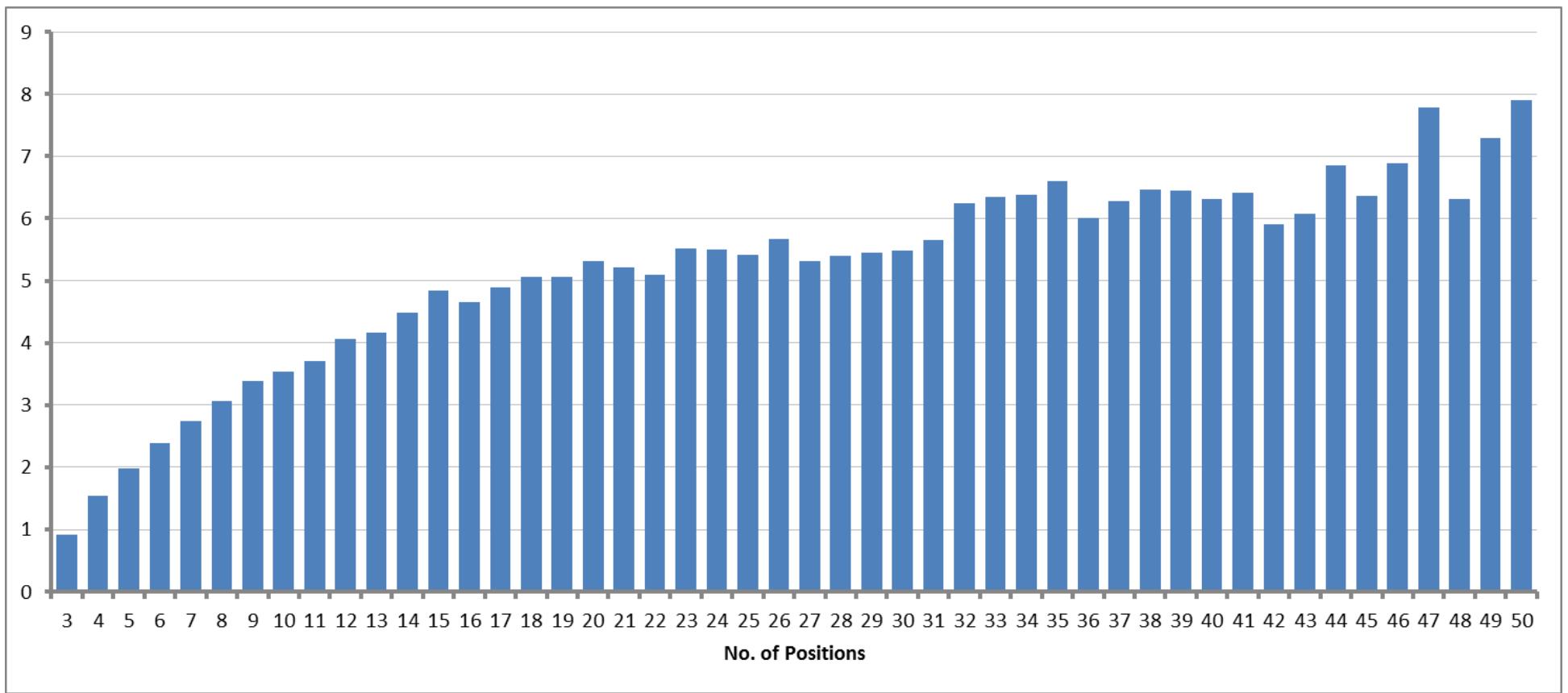
$$\bar{\sigma}_{\text{weighted}} = \sum_i w_i \cdot \sigma_i$$

**Quantitative portfolio theory showed us:  $\sigma_p \leq \bar{\sigma}_{\text{weighted}}$**

# Diversification and Quantitative Portfolio Analysis III

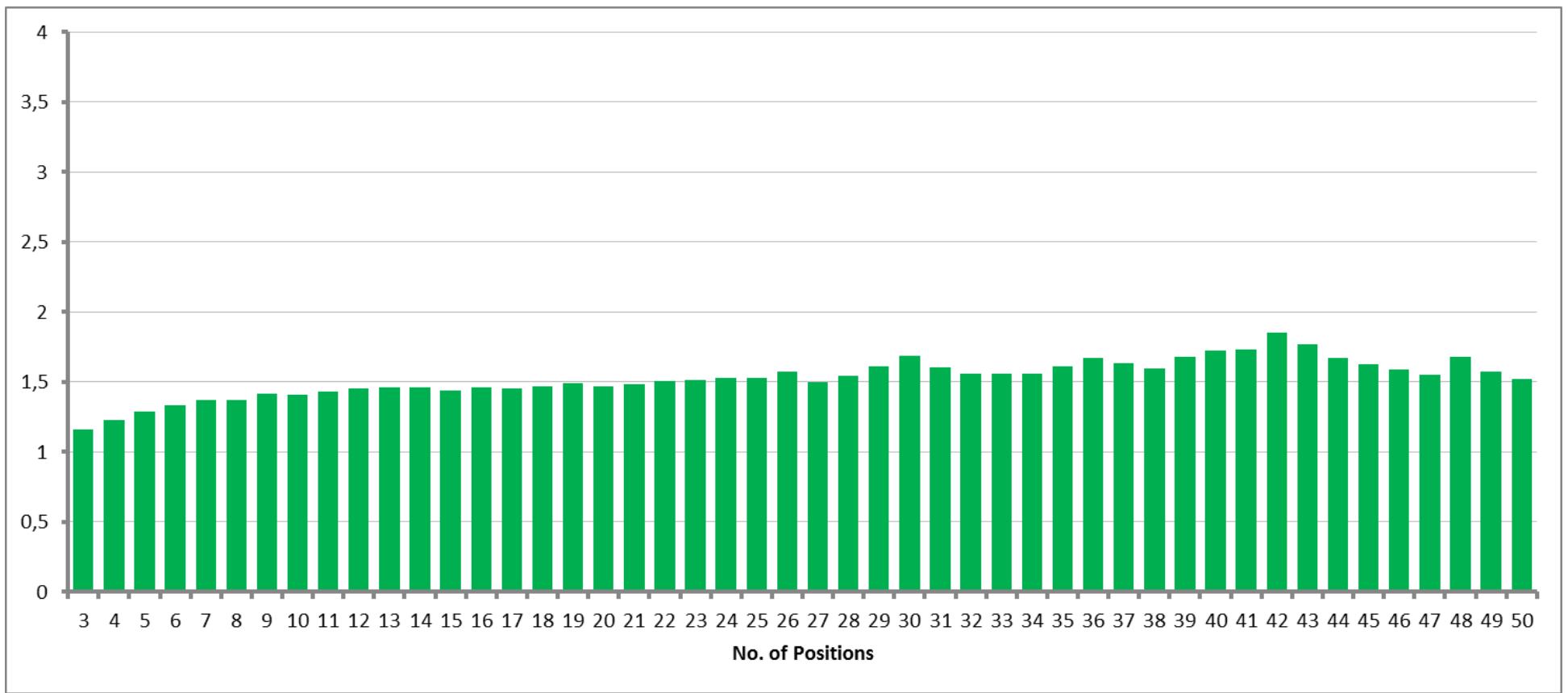


# Number of Positions and their Diversification Potential I



$$Div_{delta} := \bar{\sigma}_{weighted} - \sigma_p$$

# Number of Positions and their Diversification Potential II



$$Div_{ratio} := \bar{\sigma}_{weighted}/\sigma_p$$

# Do We Have More Information?

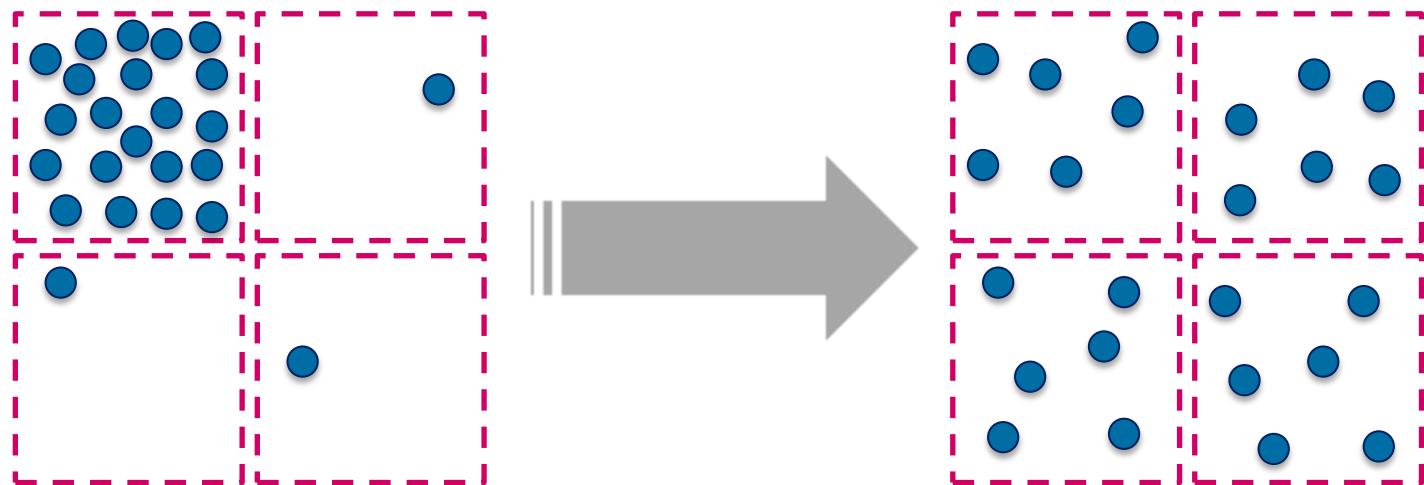
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Information about positions and their role in a portfolio,  
e.g.

- **Instrument types** (Funds vs. Equities vs. Bonds)
- **Asset classes**
- **Sectors, Regions, Currencies, ...**
- **Issuers, Ratings, ...**

# Information Entropy

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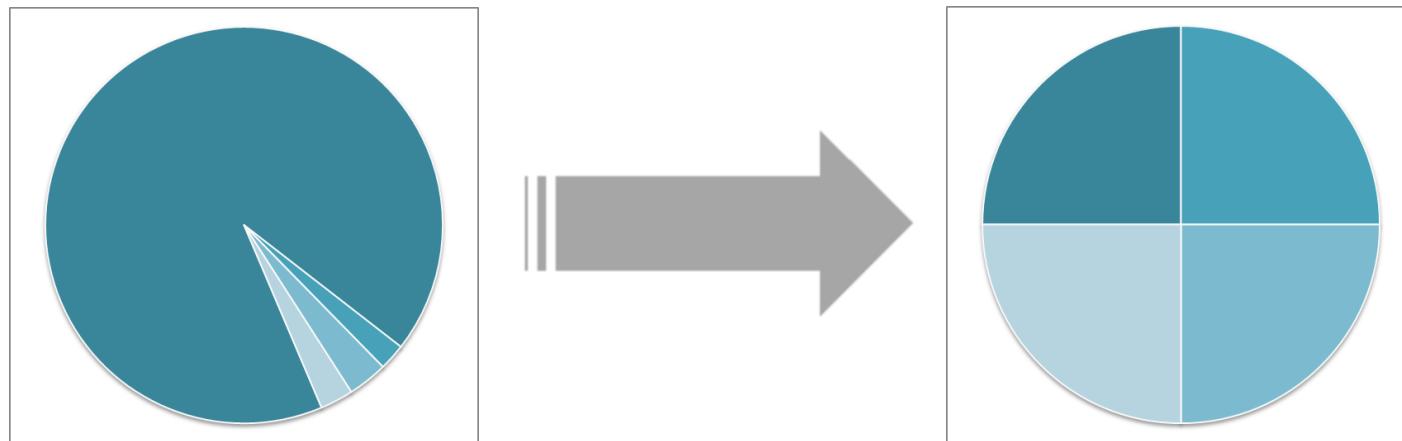
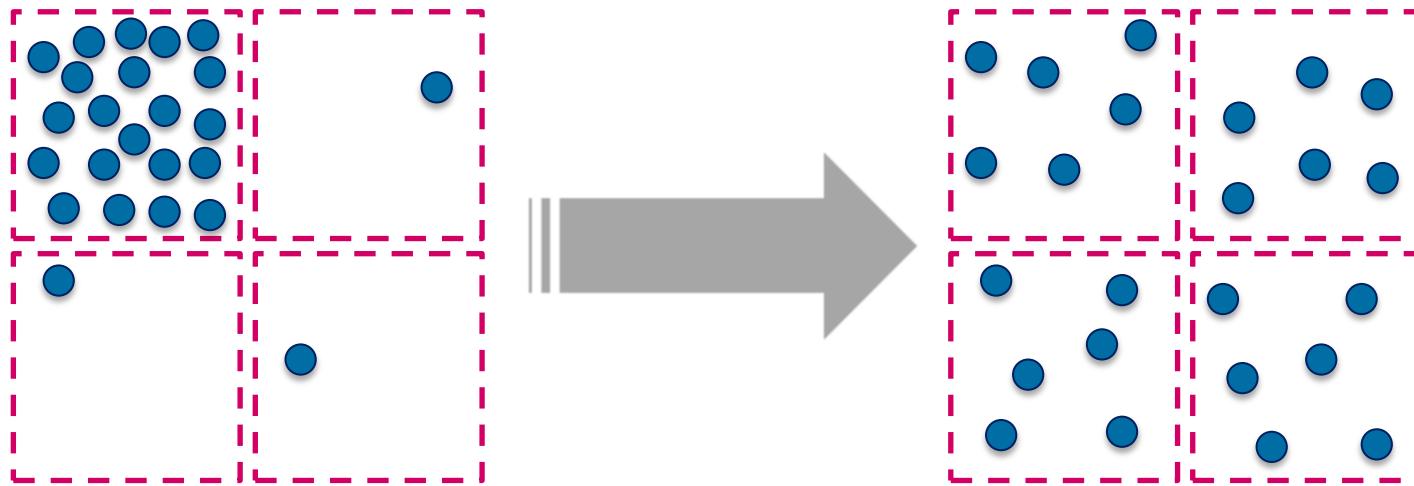
# Diversification and Information Theoretic Measures

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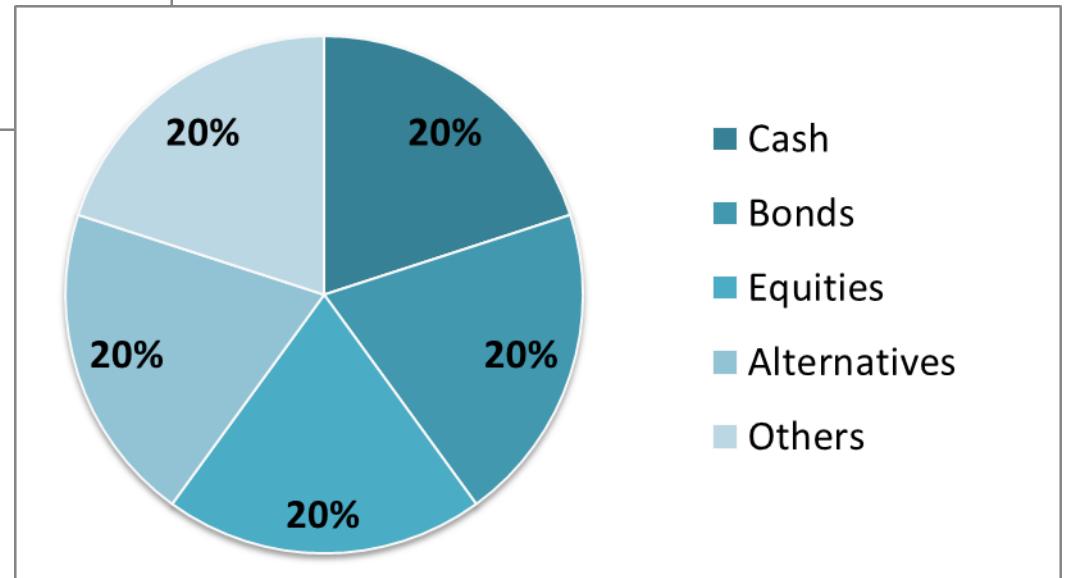
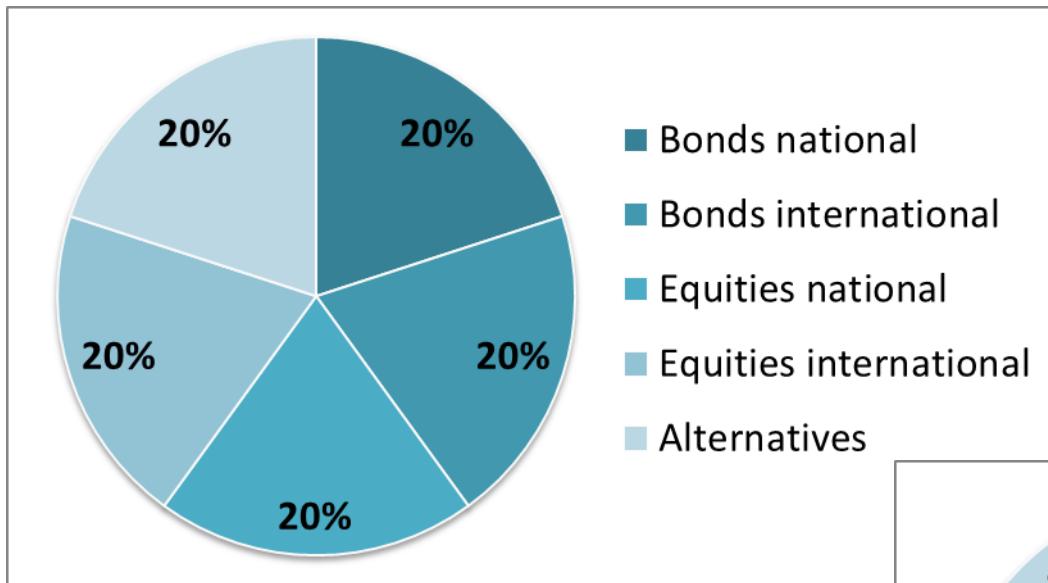
## Basic motivation – distributions and information

- A distribution with equal weights for all categories can be understood as a distribution "without specific information".
- A distribution without information is understood as the distribution with the maximum information entropy, and therefore as the natural, i.e. best solution.
- A portfolio with equal distribution of all asset classes can be understood as a portfolio distribution "without additional information".
- A portfolio with equal distribution of all asset classes is showing the best diversification.

# Information Entropy and the Naturally Diversified Portfolio

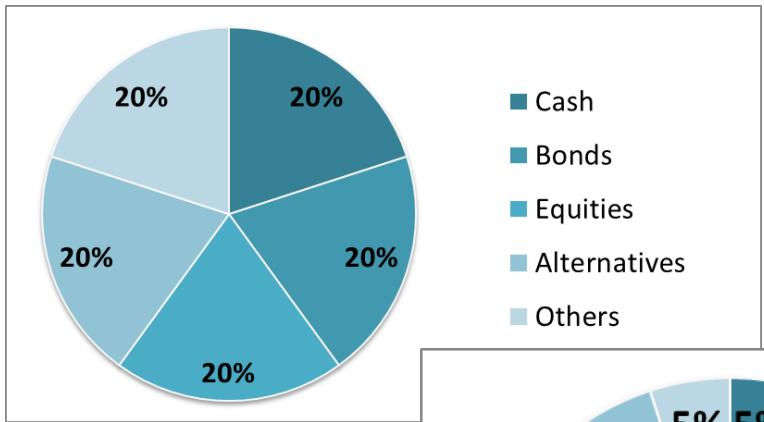


# Is the Equally Distributed Portfolio well Diversified?

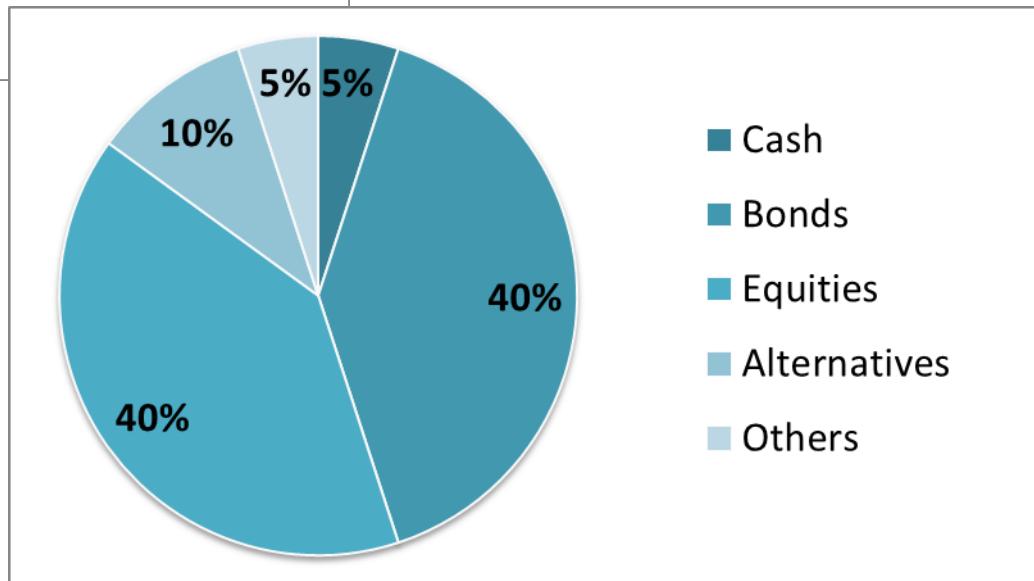


# Equally Distributed Portfolios and Domain Specific Knowledge

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- Domain specific knowledge is available
- Knowledge is information



# Apply Information and Knowledge in a Relative Measure

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## Basic motivation - relative approach

- The absolute diversification is formally identical to a relative measure versus a portfolio with equal distribution along all asset classes.
- The portfolio with equal distribution is not automatically a reasonable target allocation.
- A relative approach evaluates the difference to a target asset allocation, defined as 'active weights'.
- A relative approach evaluating active weights can apply a specific target allocation, defined according to business requirements.

# Frameworks Giving Orientation Defining Target Portfolios

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**CAPM: The market portfolio,**

But the orientation in a multi asset class portfolio is limited

General asset management and advice principles:

**The balanced portfolio,**

often showing equal distribution between bonds and equities,  
but typically includes more

# A Proposal for a Relative Measure of Diversification

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Principle motivation for the algorithm:

Apply well known metrics: 2-norm,  
the formal equivalent of the Euclidian  
distance in higher dimensions

(i) Active weights for each asset class.

(ii) Aggregate active weight measures

(iii) Calibration

(iv) Calculate diversification score

## Parameters and formulas

***target(w\_i)*** := target weight for super asset class  $i$

***current(w\_i)*** := current weight for super asset class  $i$

***active(w\_i)*** :=  $(\text{target}(w_i) - \text{current}(w_i))$

***active\_score*** :=  $\text{Sqrt} (\text{Sum of } (\text{active}(w_i)^2))$

***max\_active*** := formal calibration factor

***calibrated\_active\_score*** :=  $\text{active\_score}/\text{max\_active}$

***diversification\_score*** :=  $1 - \text{calibrated\_active\_score}$

The values for *diversification\_score* range from 0% to 100%. with a score of 100% indicating a perfect distribution of super asset classes.

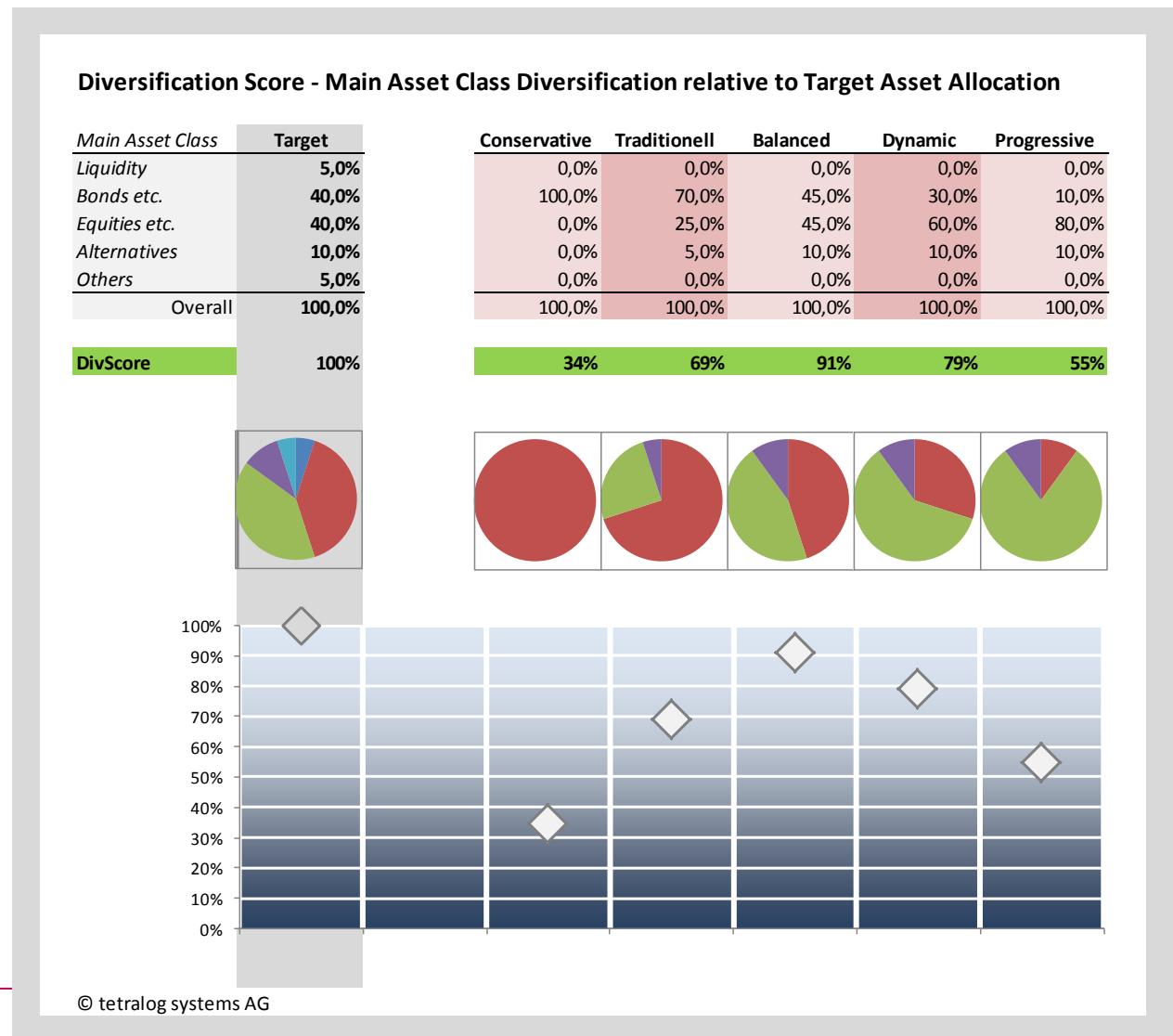
# Examples – A Set of Typical Model Portfolios

The asset allocation of the model portfolios reflect the investment strategy.

Some model portfolios show a clear overweight in some asset classes.

The diversification score reflects these imbalances.

An overall diversification measure will have to take into account additional parameters.



# Real World Implementations have to Reflect More Information

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An overall diversification measure will have to take into account available knowledge in terms of additional parameters – Apply more information.

Information about positions and their role in a portfolio,  
e.g.

- Instrument types
- Asset classes
- Sectors, Regions, Currencies
- Issuers, Ratings, ...

# Real world example

Anlagevorschlag.

Vorgesehene Wertpapiertransaktionen für die Umsetzung des Anlagevorschlags.

**KÄUFE**

ISIN	Wertpapier	Kurs*	Handels-währung	Nom./Stück aktuell	Anpassung in Nom./Stück	Anpassung in EUR
AT0000801063	PIA Komfort Inv konservativ (T)	11,94	EUR	0,00	1.456,00	17.384,64
AT0000811252	PIA EURO CORP BOND (T)	134,27	EUR	0,00	51,00	6.847,77
LU0313644931	Pioneer € Aggreg Bond (T)	74,93	EUR	0,00	139,00	10.415,27
<b>SUMME KÄUFE</b>						<b>34.647,68</b>

\*<sup>1</sup> Preise fehlbelegt.

**VERKÄUFE**

ISIN	Wertpapier	Kurs*	Handels-währung	Nom./Stück aktuell	Anpassung in Nom./Stück	Anpassung in EUR
AT0000347497	VAR_BA-CA Wohnbau 02 - 2017	97,40	EUR	15.000,00	-15.000,00	-145.10,00
AT000B042452	UCBA Fix-Floater12-155.40	100,80	EUR	20.000,00	-20.000,00	-20.160,00
<b>SUMME VERKÄUFE</b>						<b>-34.770,00</b>

Bewertungszeitraum: 20.05.2014  
\*<sup>1</sup> Preise fehlbelegt.

Die Streuung Ihrer Wertpapierveranlagung – exklusive Vermögensmanagement – stellt sich nach Umsetzung der oben vorgeschlagenen Transaktionen wie folgt dar:

**Streuung danach.**

Mai 2014

Die Streuung Ihrer Wertpapierveranlagung ist unabhängig von Ihrer Anlagestrategie insgesamt ausreichend. Für bestimmte Anlagestrategien ist die einseitige Ausrichtung des Portfolios jedoch erforderlich.

Ein Teil ihrer Investitionen erfolgt durch gemischte Fonds, deren Einzelinvestments in Anleihen, Aktien und weiteren Investments erfolgen. Die Investments aus gemischten Fonds wurden gemäß öffentlich verfügbarer Informationen auf die anderen Anlageklassen verteilt.

Sie veranlagten in 5 Anlageklassen. Ein relevanter Teil Ihrer Wertpapierveranlagung erfolgt in die folgenden Anlageklassen: Alternative Veranlagungen, Anleihen & ähnliche Werte

**Unabhängige Zertifizierung**

Streuungsindikator ist ein Maß zur Beurteilung der aktuellen Risikostreuung im Portfolio unabhängig von einer etwigen Investmentstrategie.

Geprüfte Risiko-streuung

Zertifikat 2014  
Prof. Dr. Thorsten Hens

Anlagevorschlag | Seite 6 von 13

**institut für  
vermögensaufbau**

# Geprüfte Risiko- streuung

Zertifiziert 2014

in Zusammenarbeit mit

**Prof. Dr. Thorsten Hens,  
Universität Zürich**

★★★★★

# Conclusion: Challenges and Possibilities

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- Depending on the available data structures diversification can be assessed in multiple ways
- A universal diversification measure allows for the discussion of portfolio quality from a new perspective
- The diversification score does not allow for a simple „more is better“ approach. It requires a consequent reflection of investors' goals and needs



# Thank you.

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