

# **MEASURING REAL ESTATE RISK**

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# CONTENT

1. **What are the most important real estate risks and the best measures for them?**
2. **Example for measuring a real estate risk**
3. **Conclusion**

# WHAT ARE THE MOST IMPORTANT REAL ESTATE RISKS?

## WHAT DOES THE RESEARCH SAY?

A general answer is not possible because ...

- **...risks are not clearly defined**

e.g., the risk of construction cost overruns can also be employee risk (cause: incorrect planning) or the risk of fluctuating prices

- **...risks are situation-dependent**

e.g., in a down market vacancy is a risk, in an up market it is not

- **...are perceived differently from person to person**

e.g., a pessimistic person regards a probability of 80% as high, an optimistic person sees it as a 20%-opportunity

- **...risks usually occur together with others**

e.g., the tenant default risk often goes hand in hand with the rent default risk and the vacancy risk

- **...there are different ways to measure risks**

# WHAT ARE THE BEST MEASURES FOR REAL ESTATE RISK? WHAT DOES THE RESEARCH SAY?

Again, a general answer is not possible because the risk measure has to fit what you want to measure.

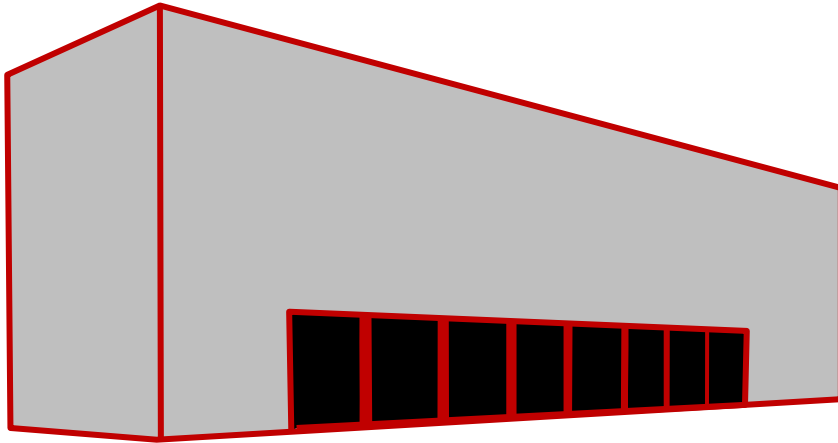
## Examples:

- Tenant default → Probability of default → Rating grade
- Change in market prices → Fluctuation → Volatility/Variance
- Vacancy risk → Expected point in time when lease contracts will end → Weighted average remaining lease term (WALT)

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# EXAMPLE: COST OVERRUN RISK



**Case: A developer plans to build a warehouse for US\$1 million, fully financed with a bank loan. Company reserves are \$0.6 mn.**

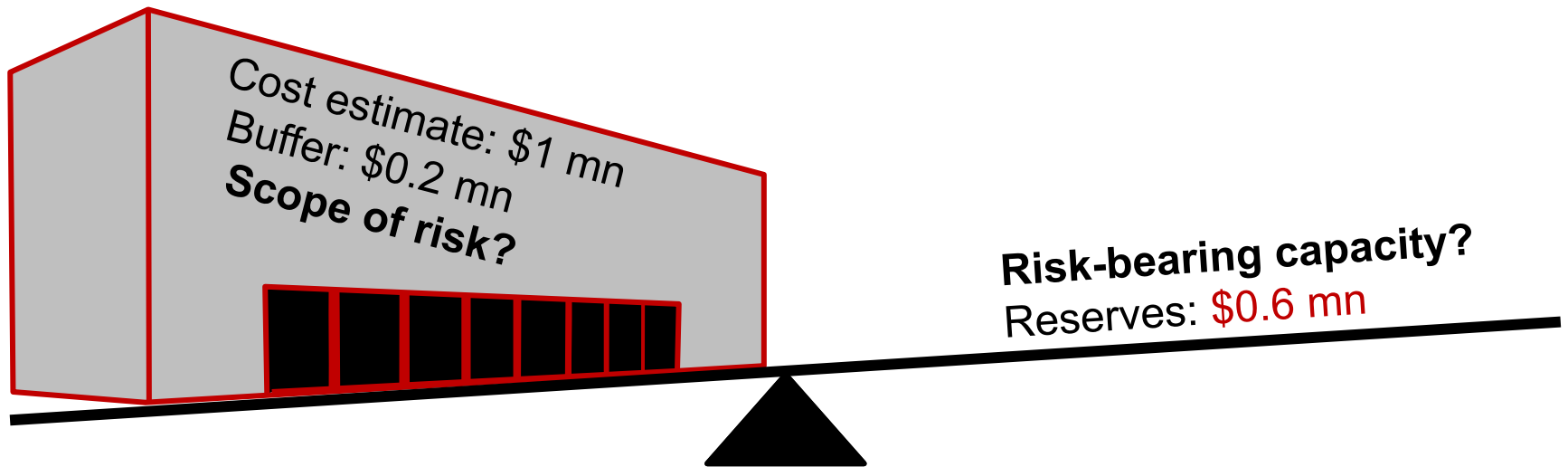
**One possible cause: insolvency of the construction company**



**One common risk: cost overruns**



**One possible consequence: existence of the development company is threatened**



### Central question: How severe is the risk?

- a) Negligible (0-10%, the risk disappears in the project budget)
- b) Significant (11-20%, risk reduces the return on investment)
- c) Serious (21-60%, the risk can be covered by the reserves)
- d) Critical (>60%, the risk is higher than the reserves)

**More precisely: How much money do I need to cover the risk?**

# QUALITATIVE RISK MEASUREMENT

**1: Scoring → suitable for risks that are difficult to express in numbers or for which there is not enough data; not readily suitable for producing a number**

**Dependent variable:** Cost overrun

**Independent variables:** Contractors (proxy: reputation), building material costs (proxy: cost index increase), complexity (proxy: total costs)

	<b>Evaluation</b>	<b>Weight</b>	<b>Partial Score</b>
<b>Reputation</b>	<b>3 (good)</b>	<b>30%</b>	<b>0.9</b>
<b>Index</b>	<b>8 (very high)</b>	<b>20%</b>	<b>1.6</b>
<b>Total costs</b>	<b>2 (low)</b>	<b>50%</b>	<b>1.0</b>
<b>Score</b>			<b>3.5</b>

**Scale:** 1-2 = negligible , 3-5 = significant, 6-8 = serious, 9-10 = critical

**Result:** The project has a significant risk; costs may be 11-20% higher than expected



# QUANTITATIVE RISK MEASUREMENT

Probability

100%

2: Estimate/guess the expected value  
→ Safety illusion

0%  
\$0

\$1 mn

Costs



# QUANTITATIVE RISK MEASUREMENT

3: Worst / Most Likely / Best Case Scenario →  
Overestimation of extreme events,  
underestimation of surprising events

Probability

100%

50%

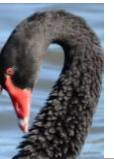
25%

0%

0.8  
mn

1  
mn

1.7  
mn



Best Case:  
\$0.2mn less

Range:  
\$0.9 mn

Worst Case:  
\$0.7 mn more

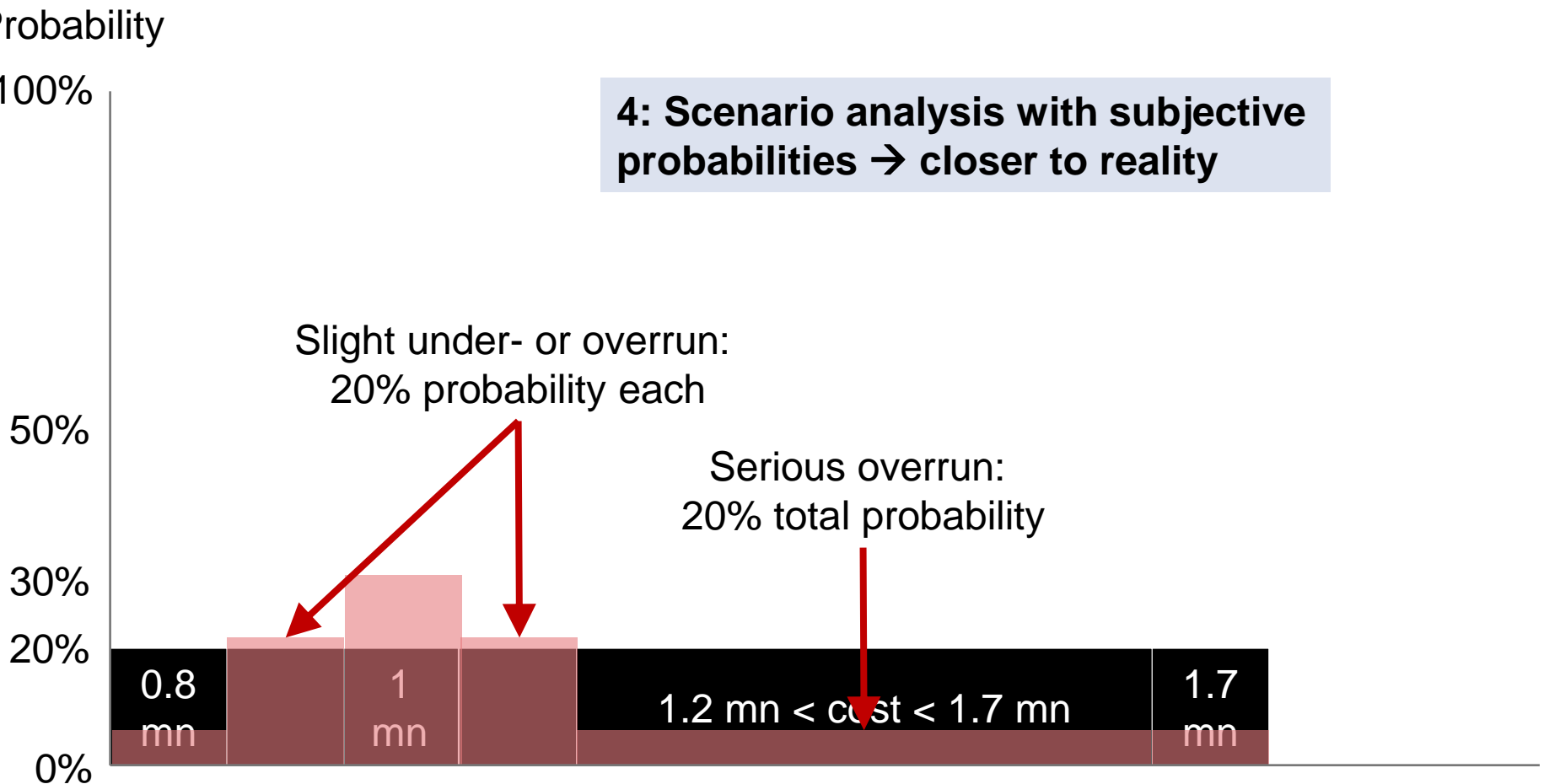


# QUANTITATIVE RISK MEASUREMENT

4: Scenario analysis with subjective probabilities → closer to reality

Slight under- or overrun:  
20% probability each

Serious overrun:  
20% total probability



Best Case:  
5% probability

Worst Case:  
5% probability

# QUANTITATIVE RISK MEASUREMENT

## 4: Scenario analysis with subjective Probabilities → closer to reality

Probability

100%

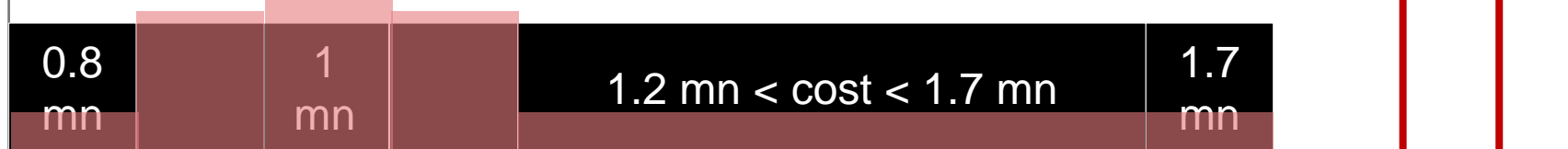
50%

30%

20%

0%

Scenario	Probability	Result (\$ mn )	Expected value (\$ mn)
Best case	5%	0.8	0.04
Slightly lower	20%	0.9	0.18
Base case	30%	1.0	0.30
slightly higher	20%	1.1	0.22
much higher	20%	1.4	0.28
Worst case	5%	1.7	0.09
	<u>100%</u>		<u>1.11</u>



Realistic  
expected value:  
\$1.1 mn

Expected damage value:  
\$0.59 mn

# QUANTITATIVE RISK MEASUREMENT

5: Calculating with probability distributions → even closer to reality and further insights into the risk

Probability

100%

50%

0%

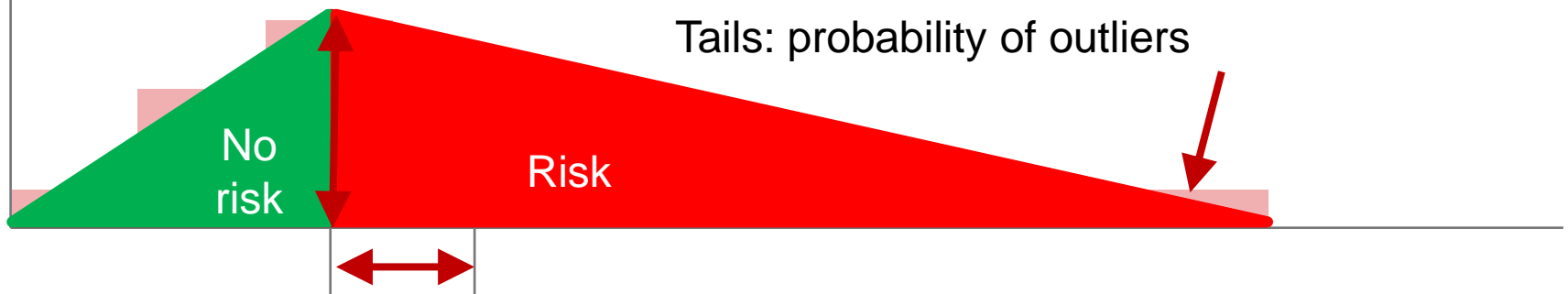
Curtosis: concentration on the centre

Tails: probability of outliers

No risk

Risk

Skewness: most frequent value  $\neq$  expected value



# QUANTITATIVE RISK MEASUREMENT

## 6: Monte Carlo Simulation → mapping of reality



1st spin: \$1.03 mn  
2nd spin: \$1.29 mn  
3rd spin: \$0.95 mn

Probability

100%

50%

0%



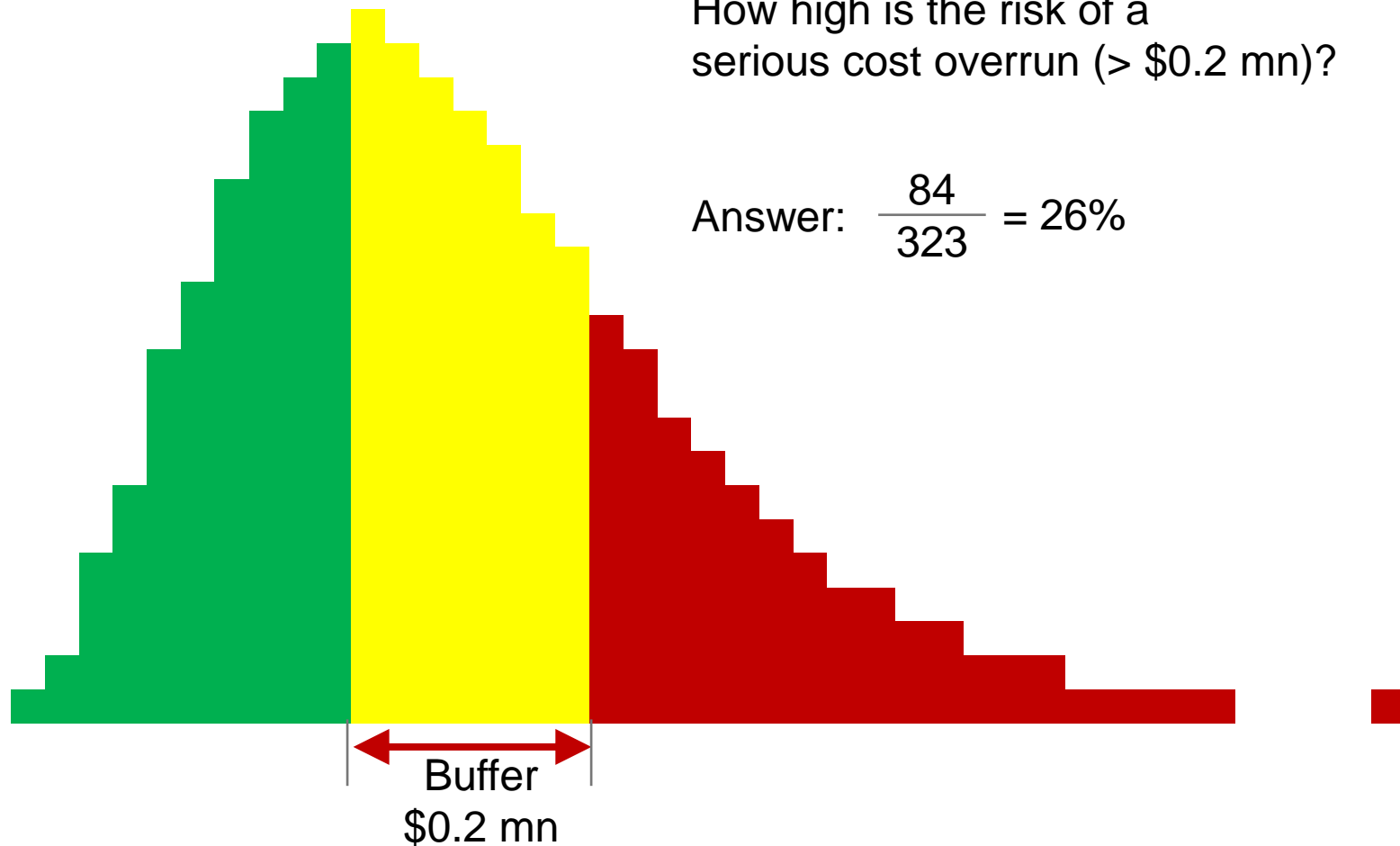
# MONTE CARLO SIMULATION



# MONTE CARLO SIMULATION

How high is the risk of a serious cost overrun (> \$0.2 mn)?

Answer:  $\frac{84}{323} = 26\%$

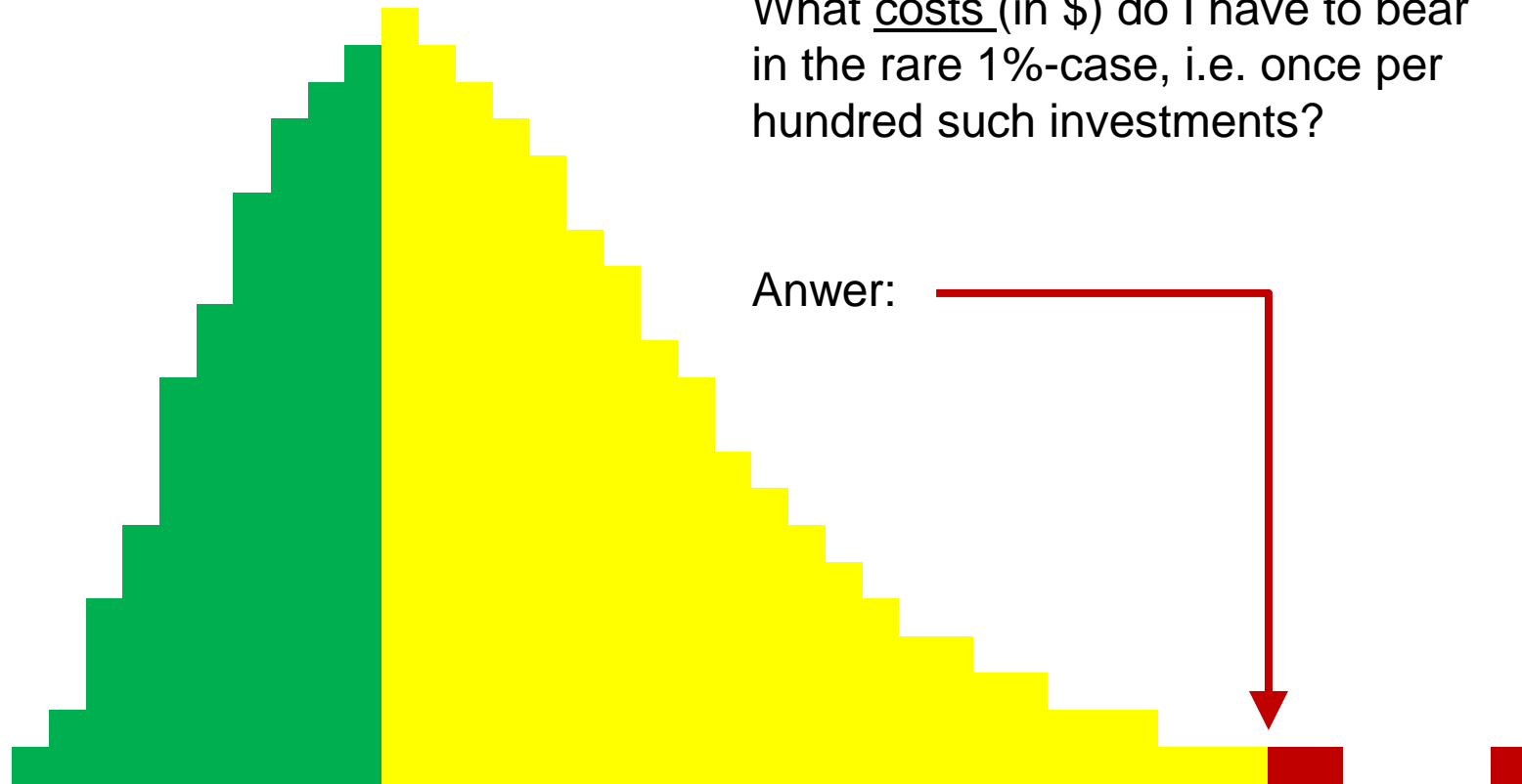




# MONTE CARLO SIMULATION

What costs (in \$) do I have to bear in the rare 1%-case, i.e. once per hundred such investments?

Answer:



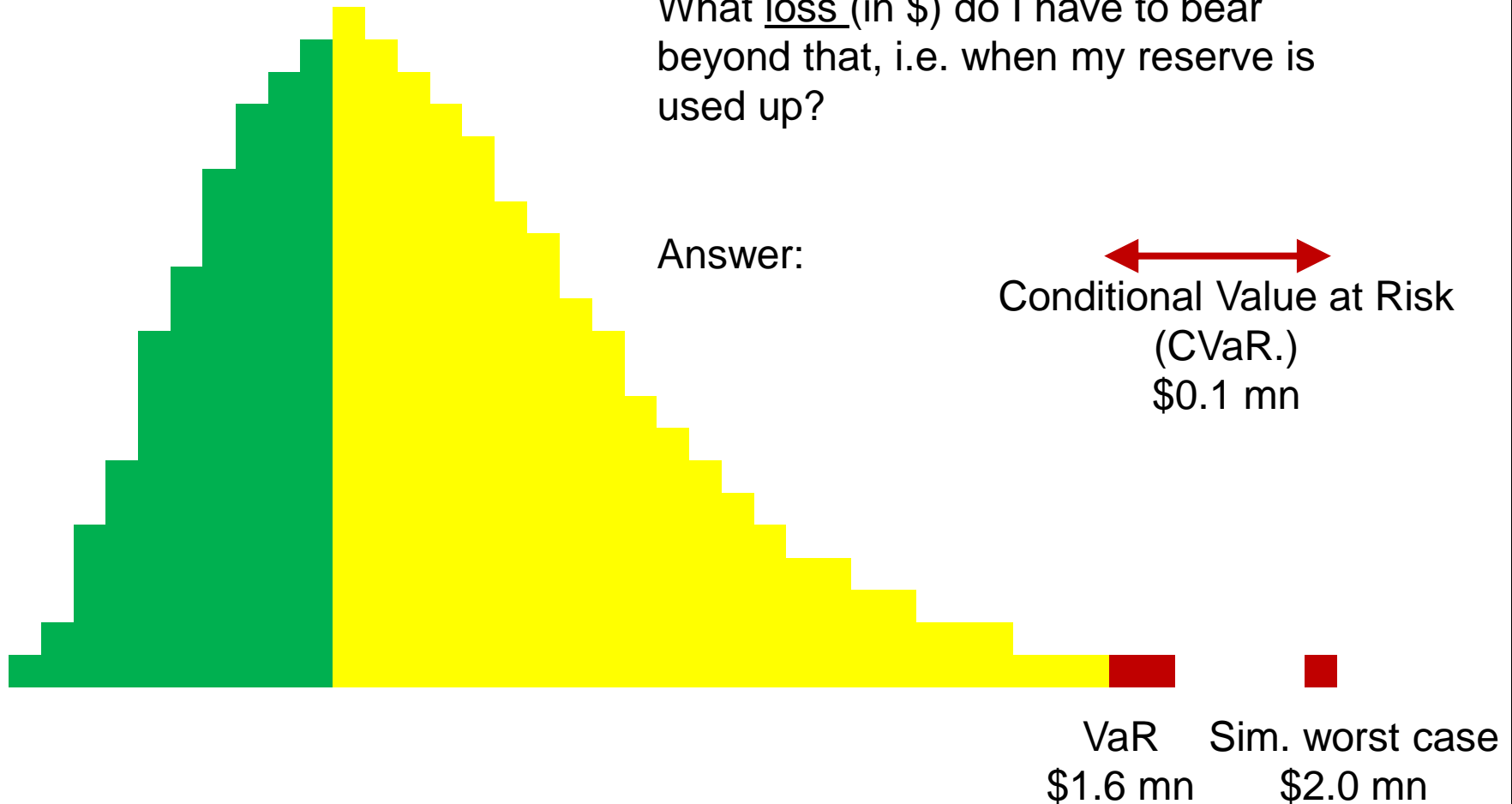
\$1.6 mn  
= Value at Risk (VaR)

# MONTE CARLO SIMULATION

What loss (in \$) do I have to bear beyond that, i.e. when my reserve is used up?

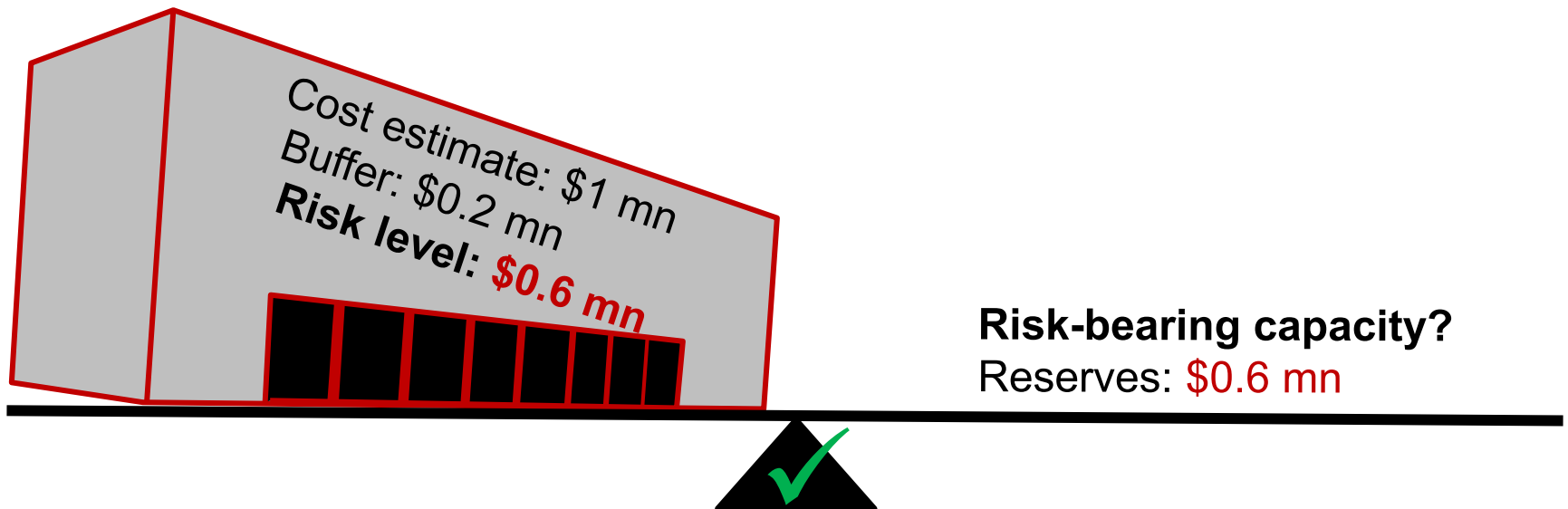
Answer:

↔  
Conditional Value at Risk  
(CVaR.)  
\$0.1 mn



# FINAL RESULT

The developer faces a significant risk of cost overrun (scoring), mainly resulting from price increases of building material. The outcome can be expected to be between \$-0.2 and \$0.7 mn (range), most likely \$0.1 mn (scenario). The developer should have reserves of \$0.6 mn to cover the cost that will occur with 99% probability (VaR). Furthermore, it would be wise to hold excess capital of \$0.1 mn to avoid going bankrupt in the remaining 1%-case (CVaR).



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# CONCLUSION

**There is no certainty in an uncertain world**

→ get away from investment calculations with pseudo-accurate estimates, strive for a true risk assessment with scenarios/simulations!

**The greatest risk is not to measure risks**

→ get away from risk ignorance, strive for explicit risk measurement as the basis for calculating risk-bearing capacity and risk provisions

**Risks can be (and should be) measured in different ways, there is no best or universal indicator** → overview is important

**Users differ in their requirements, preferences, knowledge, etc.**

→ important for the selection: Which measures do I understand? Which ones do I trust? Which ones do experts recommend?

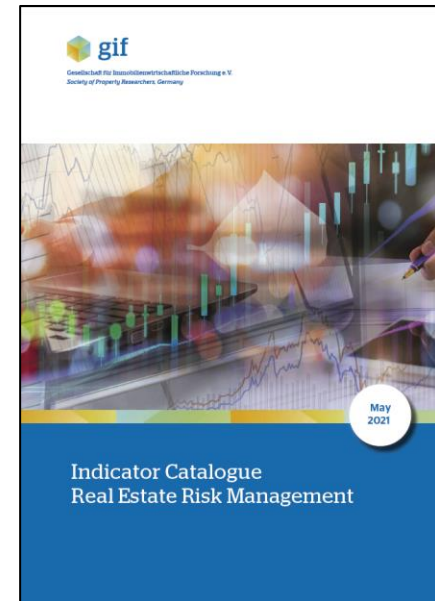
**Risk measurement is only a tool and does not prevent wrong decisions. But it does prevent us from being unprepared!**

→ „Invest in preparedness, not in prediction“ (Nassim Taleb)

# SELECTED REFERENCES

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# PERSONAL INFORMATION

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## CURRICULUM VITAE

- 2008-today Full professor of real estate, esp. real estate banking, Nürtingen-Geislingen University, Geislingen
- 1998-2005 Management consultant, Oliver Wyman, Munich
- 1994-1998 Teaching and research assistant, Chair of banking, Hohenheim University, Stuttgart; doctoral dissertation on "The Real Estate Market Risk of German Banks"
- 1989-1993 Studies in business administration and economics (Hohenheim University) and Finance (Texas A&M University)
- 1986-1989 Trainee, Westdeutsche Landesbank, Dortmund and Tokyo

## OTHER ACTIVITIES

Honorary professor, University of Cape Town, Department of Construction Economics & Management  
Lectureships at several institutions of higher education  
Society of Property Researchers (gif), co-chair competence group on real estate risk management,  
Management consultant with a focus on real estate risk management and -portfolio management for companies in the real estate and financial sector

