



The Estimate Was Certain. The Project Was Not.

Why do estimators misunderstand risk?

How does human judgment distort estimates?

What can estimators do to make uncertainty visible?

What is contingency actually for?

What does defensible decision-making look like?



Five terms. Often confused. Each with a distinct meaning.

- Uncertainty
- Variability
- Risk
- Allowance
- Contingency

The words are often used interchangeably. They should not be.

“Risk is the effect of uncertainty on objectives” (ISO 31000)

Risk exists whenever:

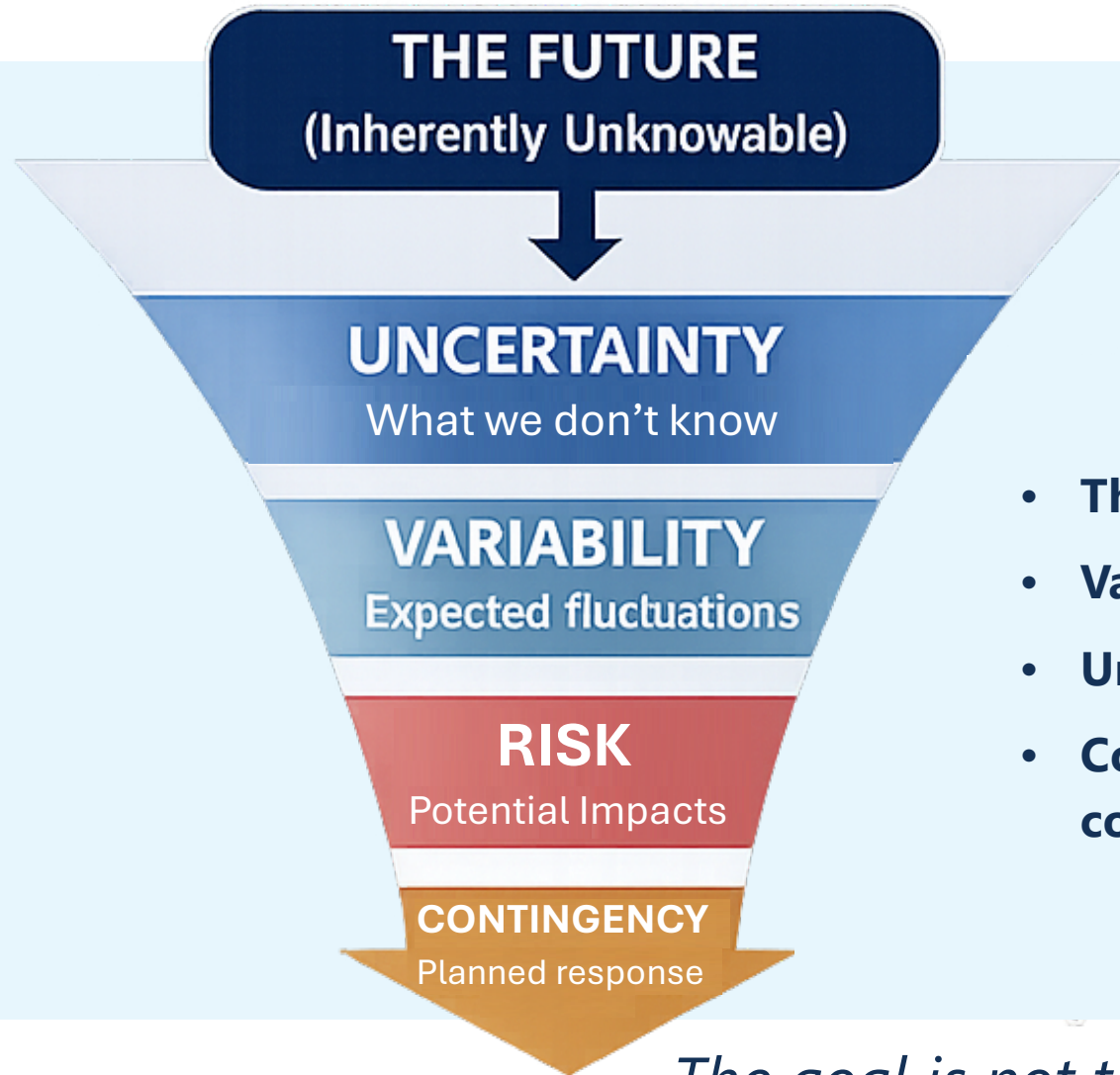
1. You have an **objective**.
2. There is **uncertainty**.
3. That uncertainty creates **risk** to the objective.
4. **Contingency** is established to absorb potential risk impacts.

In transportation estimating, risk is the effect that uncertainty may have on cost, schedule, scope, safety, or quality.

Objective	Uncertainty	Risk	Contingency
Deliver for \$500M	Number of bidders	Bids exceed estimate	Budget reserve
Open by 2032	Utility relocation duration	Construction is delayed	Schedule float
Reduce cost	Contractor innovation	ATCs reduce cost	Reduce or reallocate reserve

Variability is a type of uncertainty. It's the give already built into quantities, unit costs, and durations, not a risk event.

Allowance is budget carried in the base for known items with uncertain quantity or cost. It is not a risk reserve.



- The future cannot be known with certainty.
- Variability remains, even with a well-defined scope.
- Uncertainty creates risk to project objectives.
- Contingency prepares the project for potential consequences.

*The goal is not to predict the future.
The goal is to make better decisions despite uncertainty.*

- Low budgets do not necessarily indicate low risk.
- Aggressive schedules often transfer uncertainty into the future.
- Inadequate contingency creates hidden exposure.
- Mis-use of allowance could create funding shortfalls.
- Misallocated risks increase the likelihood of adverse outcomes.

The risk is not eliminated. It is only moved.

Three common estimating mindsets:

1. Aggressive Optimism
2. Defensive Pessimism
3. Skilled Risk Management

Few estimators are as balanced as they believe.

AGGRESSIVE OPTIMISM

Characteristics

- Favor the lowest cost estimate
- Favor the shortest schedule
- Use minimal contingency
- Do not apply allowance
- Understate risks
- Assume everything goes according to plan.

Results

- Look like a hero during project development
- Secure funding approval more easily.
- Often results in major cost growth, change orders, claims, and schedule delays

The estimate may be attractive politically, but it creates significant downside risk.

DEFENSIVE PESSIMISM

Characteristics

- Load estimates with contingency and allowance
- Build excessive schedule float
- Transfer excessive risk to contractors
- Assume the worst-case outcomes

Results

- Less likely to experience overruns
- Projects appear expensive
- Projects may struggle to compete for funding
- Over-reserving can delay other needed projects

The estimate may appear safe, but it can create opportunity cost and funding challenges.

Aggressive Management

Defensive Management

Understates Risk

- Optimism Bias
- Anchoring
- Planning Fallacy
- Overconfidence
- Political Pressure
- Confirmation Bias

Risk-Aware Realism

- Evidence-Based
- Data-informed
- Transparent
- Risk-Aware
- Defensible

Overstates Risk

- Pessimism Bias
- Worst-Case Anchoring
- Loss Aversion
- Availability Bias
- Defensive Decision-Making

The goal is not optimism or pessimism. The goal is realism.

Skilled Risk Management

Characteristics

- Identify and quantify uncertainty
- Allocate risks to the parties best able to manage them.
- Uses probabilistic forecasts.
- Establish realistic budgets and schedules.
- Manage risk throughout delivery.

Results

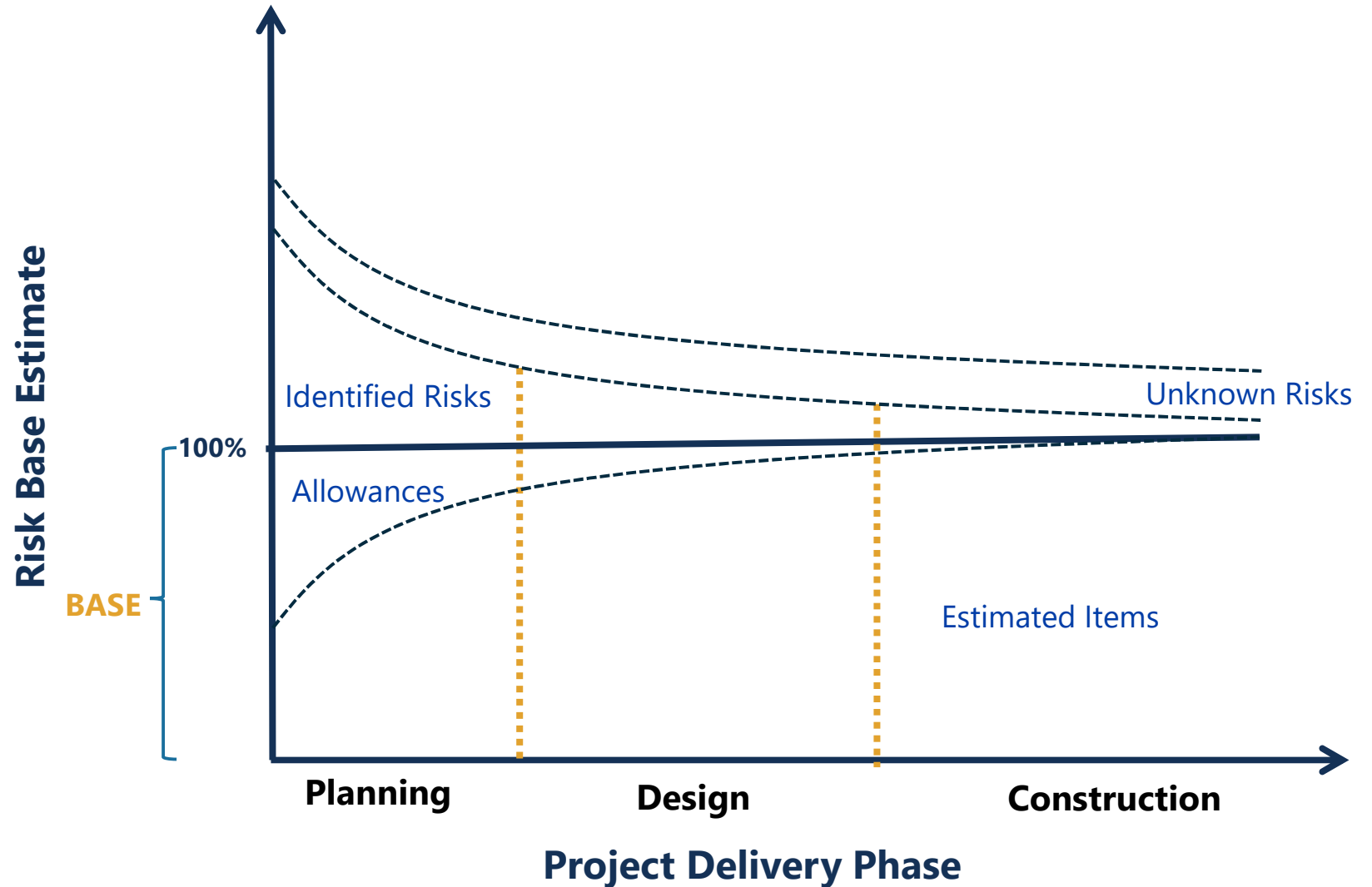
- More predictable cost growth.
- More reliable schedules.
- Fewer surprises.
- Better decisions when conditions change.

The goal is not to eliminate all bad outcomes.

The goal is to capture opportunities while limiting exposure when risks materialize.

RISK MANAGEMENT

- Projects have greater uncertainty early in development.
- As projects develop uncertainty is reduced.
- Proactive risk management can reduce uncertainty and improve outcomes.



Knowledge increases. Uncertainty decreases. Expectations remain fixed.

Estimators can make uncertainty visible by:

- Separate what is known.
- Document what is assumed.
- Quantify what is variable.
- Identify what may happen.
- Select the required confidence level.

A low estimate doesn't prove skill. Managing uncertainty does.

- **Base Variability**

We are uncertain about the estimate.

- **Market Conditions**

We are uncertain what the market will charge.

- **Identified Risks**

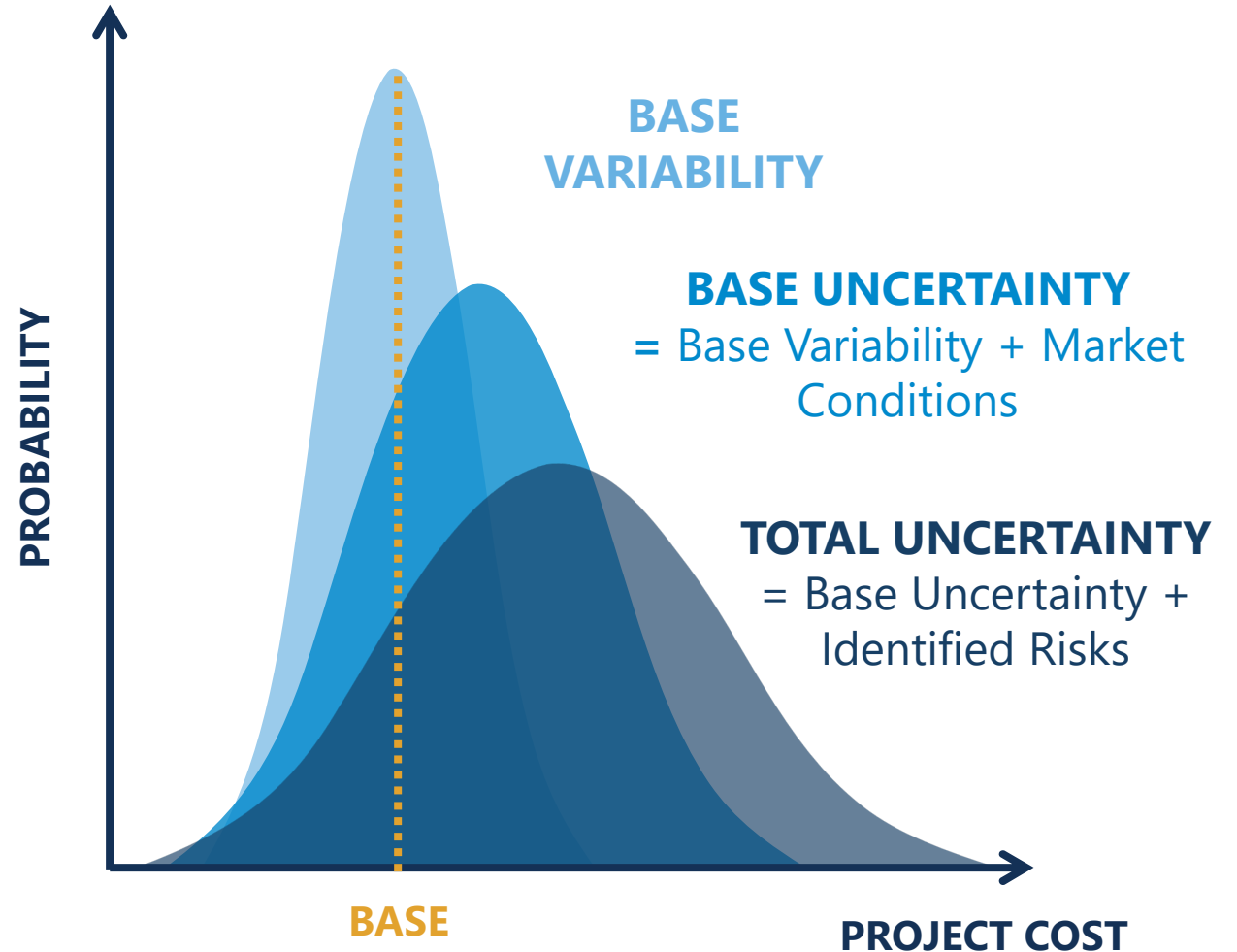
We are uncertain what may happen.

Risk lives in the space between assumption and reality.

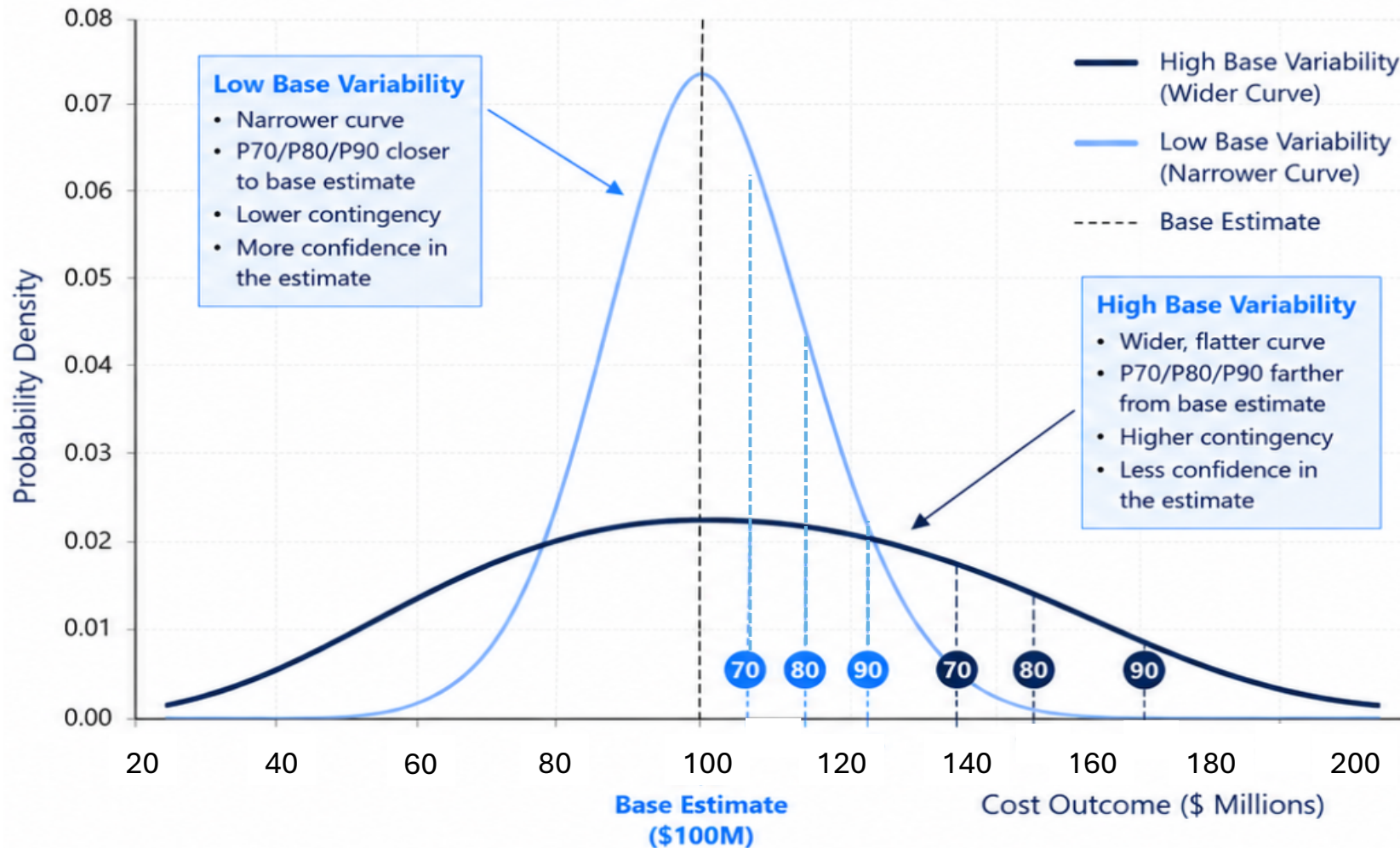
PROBABILISTIC ESTIMATE

Three sources shape the project's total uncertainty:

1. **Base Variability**
2. **Market Conditions**
3. **Identified Risk Events**



Impact of Base Variability on Total Uncertainty Curve



Base Variability reflects the estimator's limited ability to precisely predict project quantities, unit costs, and durations

Lower base variability = more confidence in the estimate.
→ narrower curve

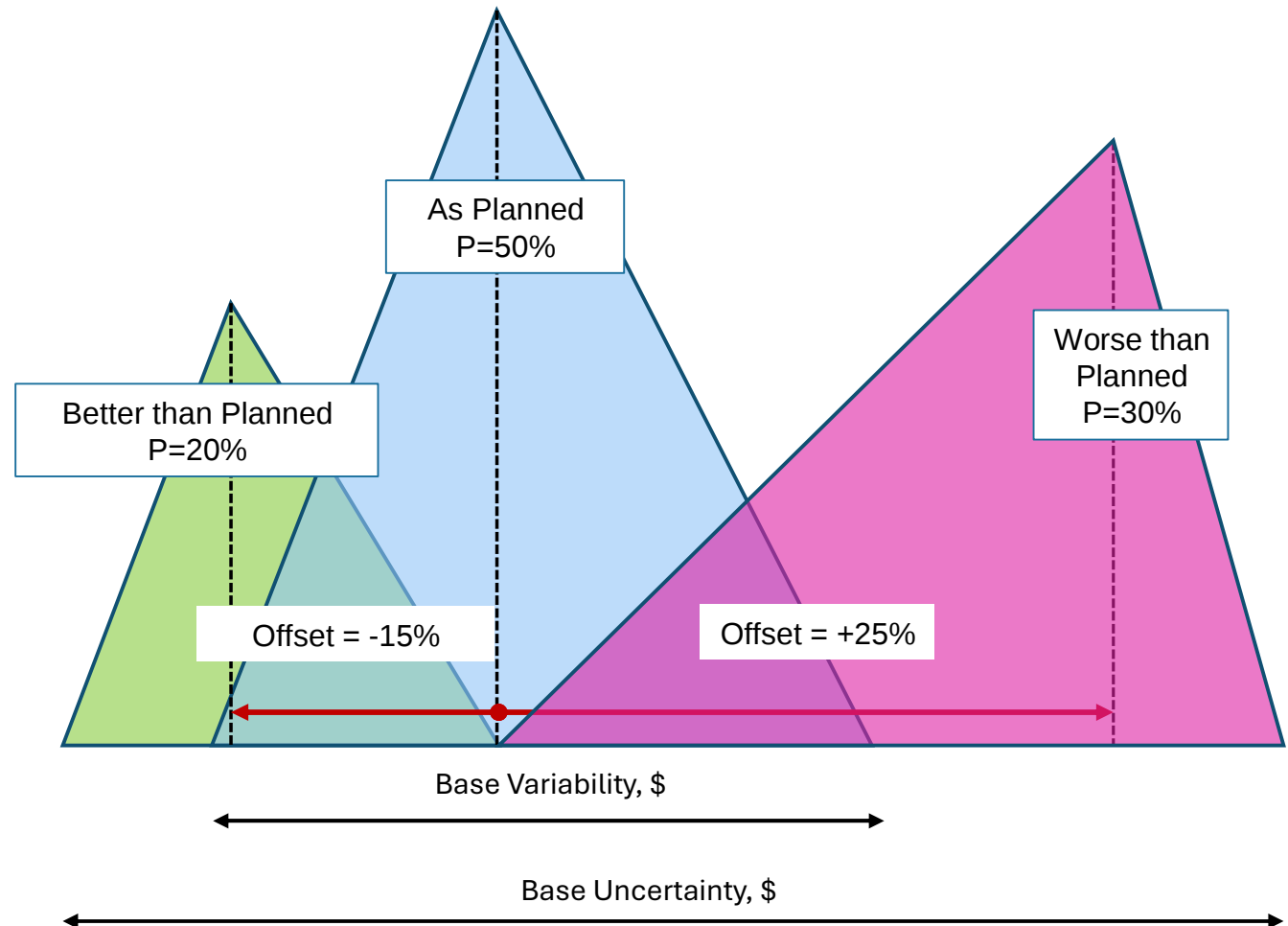
Higher base variability = less confidence and higher contingency.
→ wider curve

Base Variability is uncertainty in the estimate, not uncertainty in the project.

- **Market Conditions** reflect supply, demand, competition, and contractor capacity at the time of bidding.

Inflation is an assumption about general price growth.

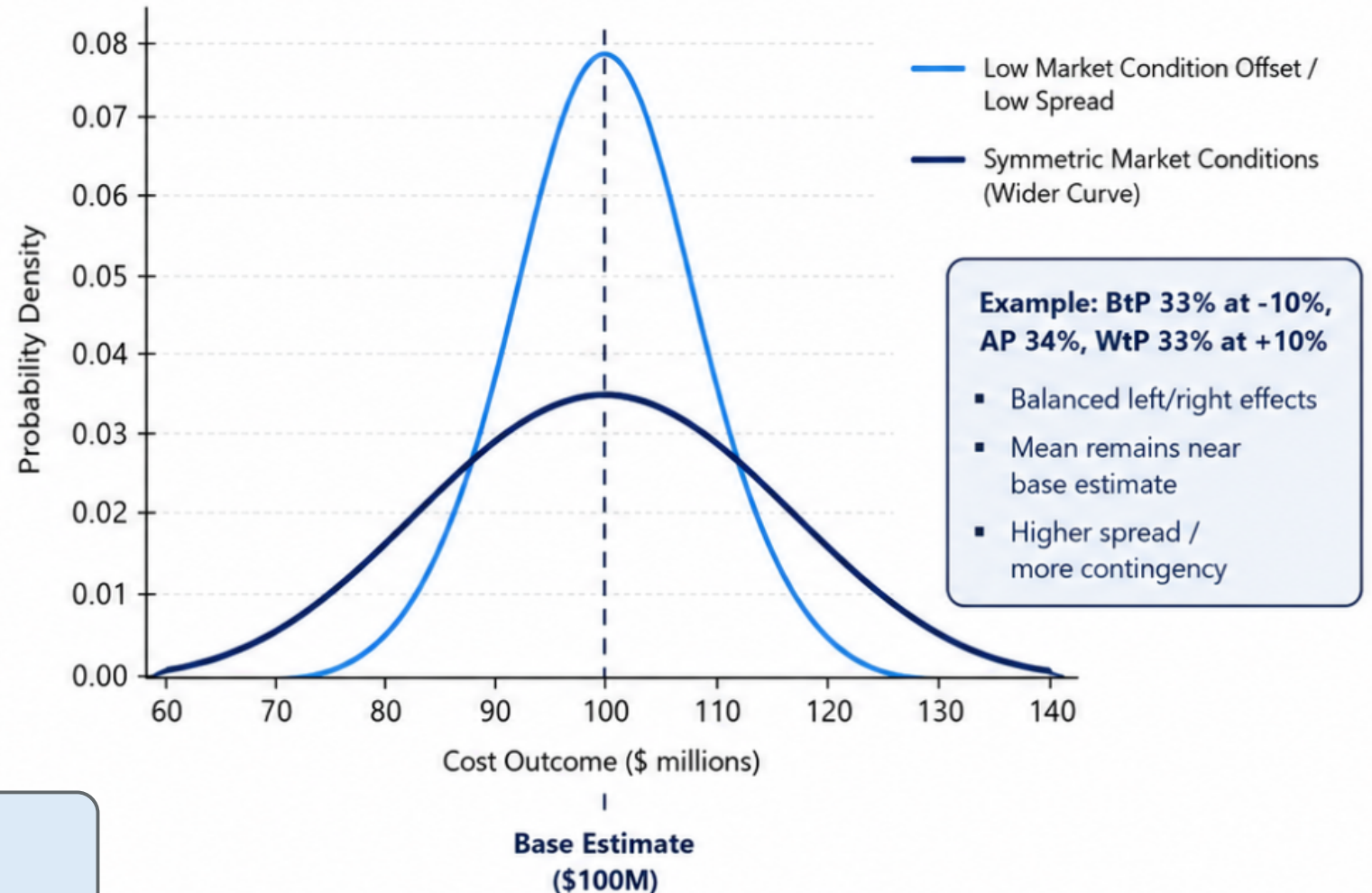
Market conditions are uncertainty about what bidders will charge.



Symmetric Market Conditions:

- Balanced positive and negative scenarios widen the distribution.
- The center remains near the base estimate.
- A wider distribution may increase contingency at a selected confidence level.

Impact of Symmetric Market Conditions on the Total Uncertainty Curve



**Balanced market scenarios:
Wider curve, little net shift**

Asymmetric Market Conditions:

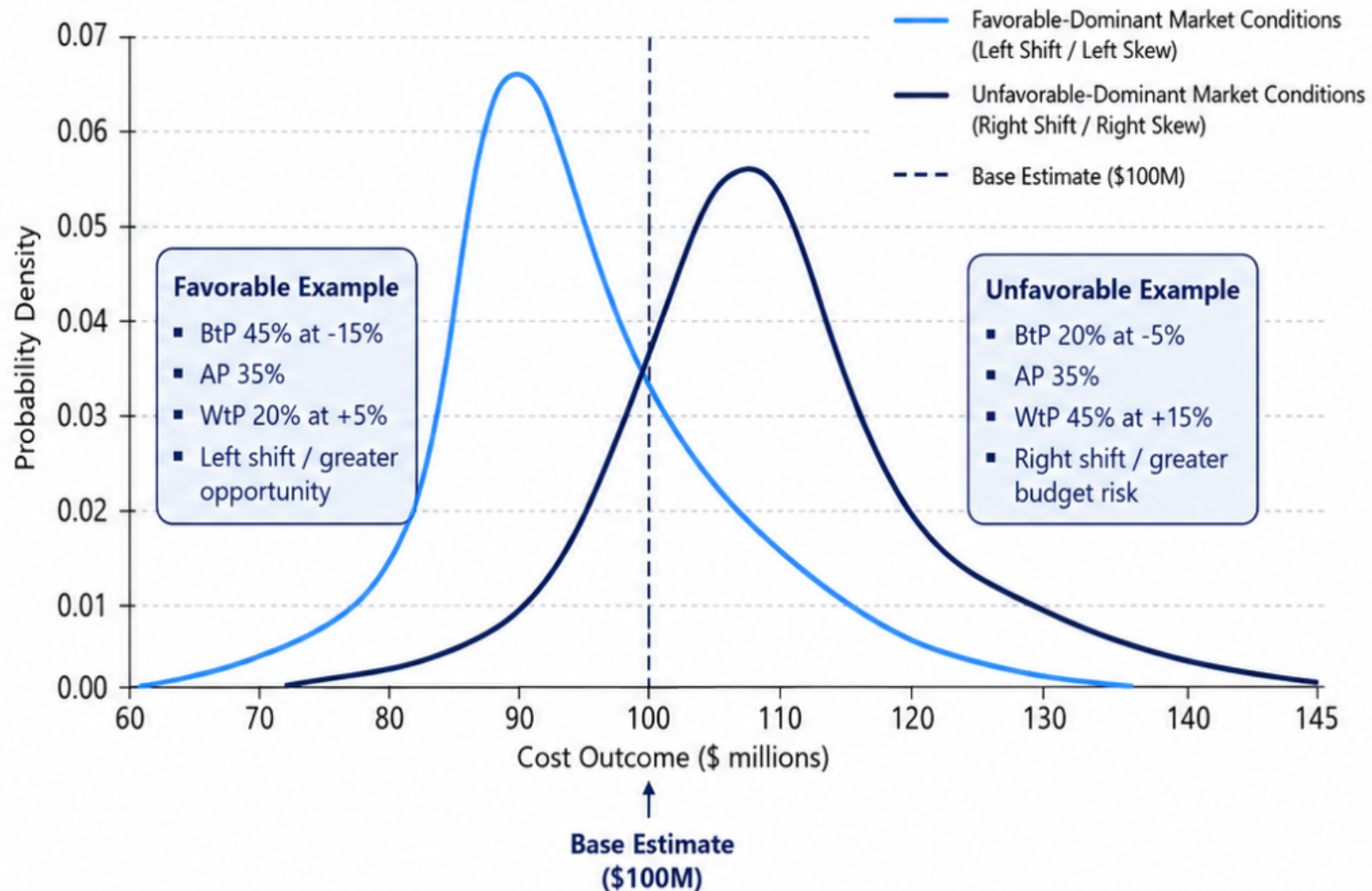
- More severe or more likely downside conditions shift the curve right.
- More severe or more likely upside conditions shift the curve left.
- Asymmetry can widen, shift, and skew the distribution.



Asymmetric market scenarios:

Shift and skew the curve, not just widen it.

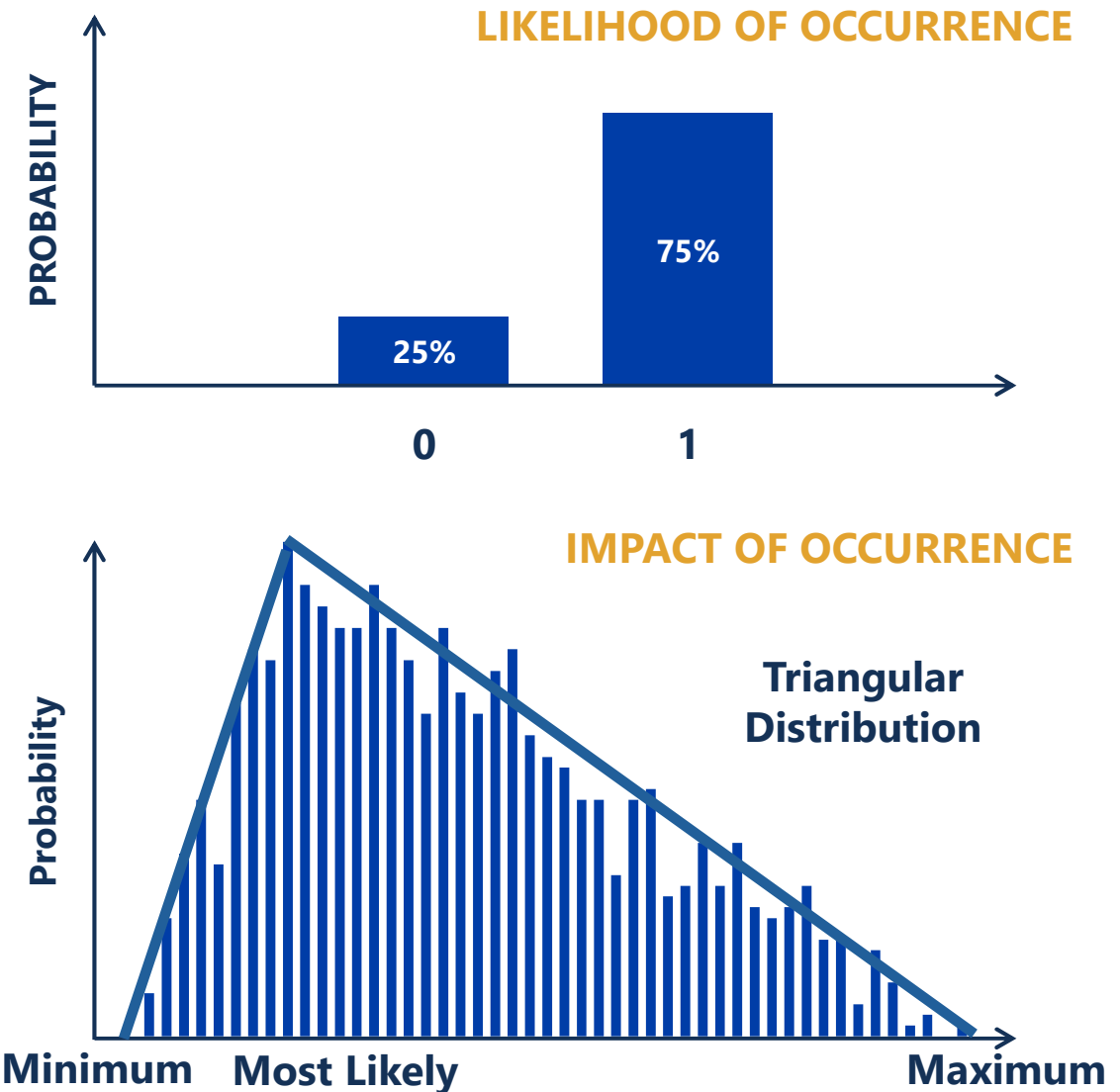
Impact of Asymmetric Market Conditions on the Total Uncertainty Curve



Identified Risk:

- Identify risks with stakeholders.
- Document risks in the risk register.
- Model only the significant risks.

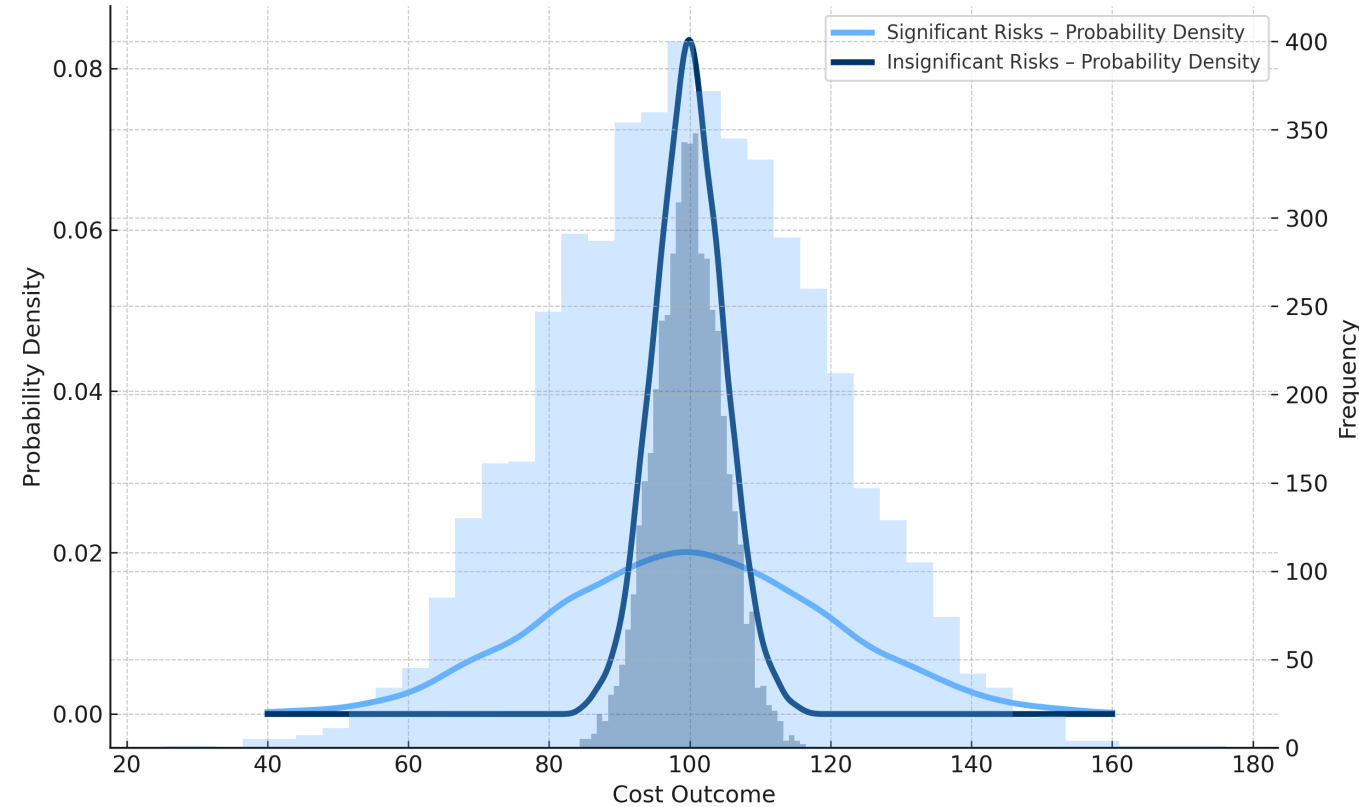
Risk registers track key threats and opportunities to cost and schedule.



Significant Risks Move the Curve

- Significant risks change the **range, shape, and tails**.
- Modeling significant risks produces a **more realistic forecast**.
- Too many minor risks add noise without improving decisions.
- Too few significant risks create false confidence.

Impact of Risk Significance on the Total Uncertainty Curve



Not every risk belongs in the model.

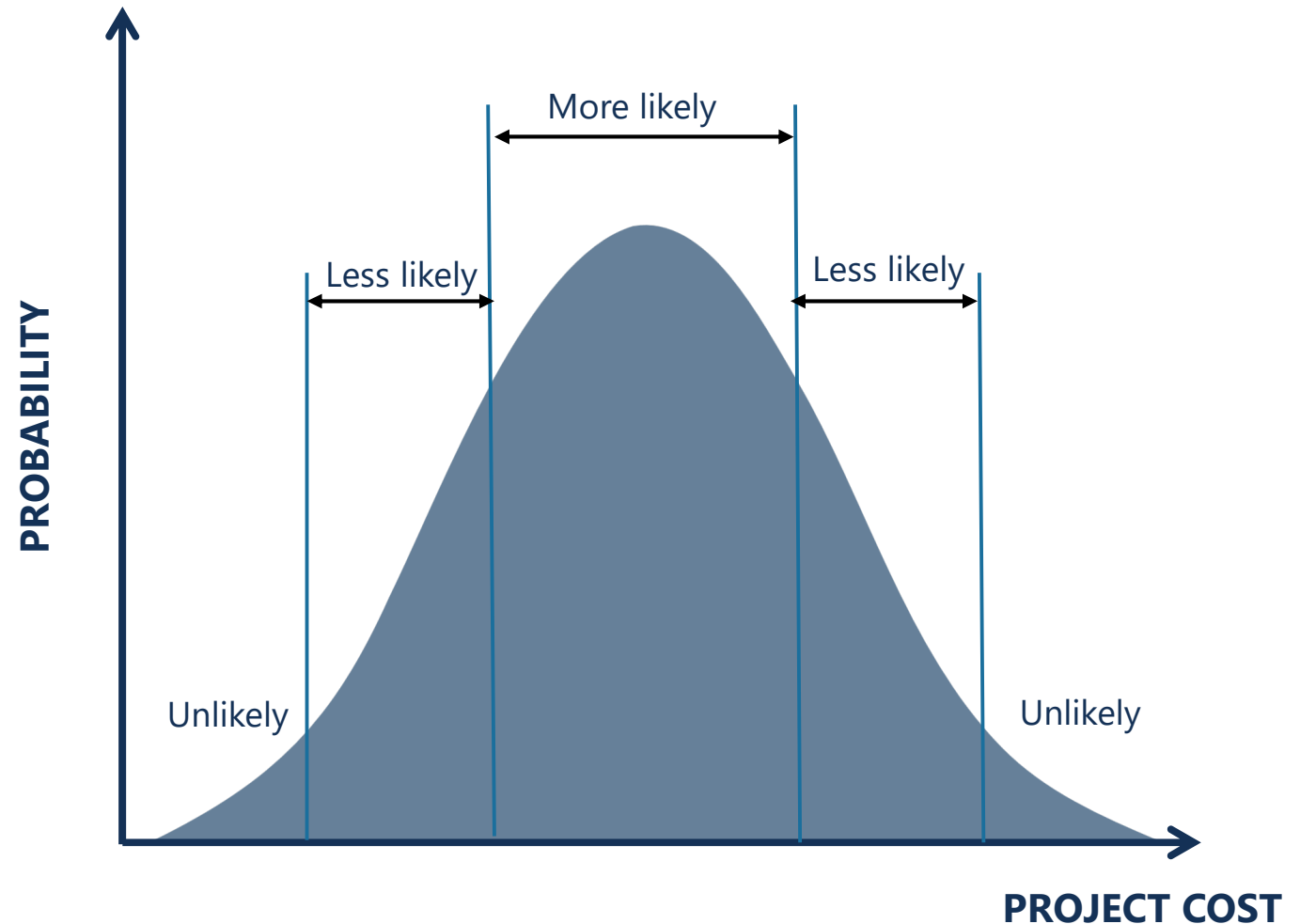
The model should focus on risks that can move the curve.

PROBABILISTIC ESTIMATE

A range of possible outcomes, not a single fixed outcome.

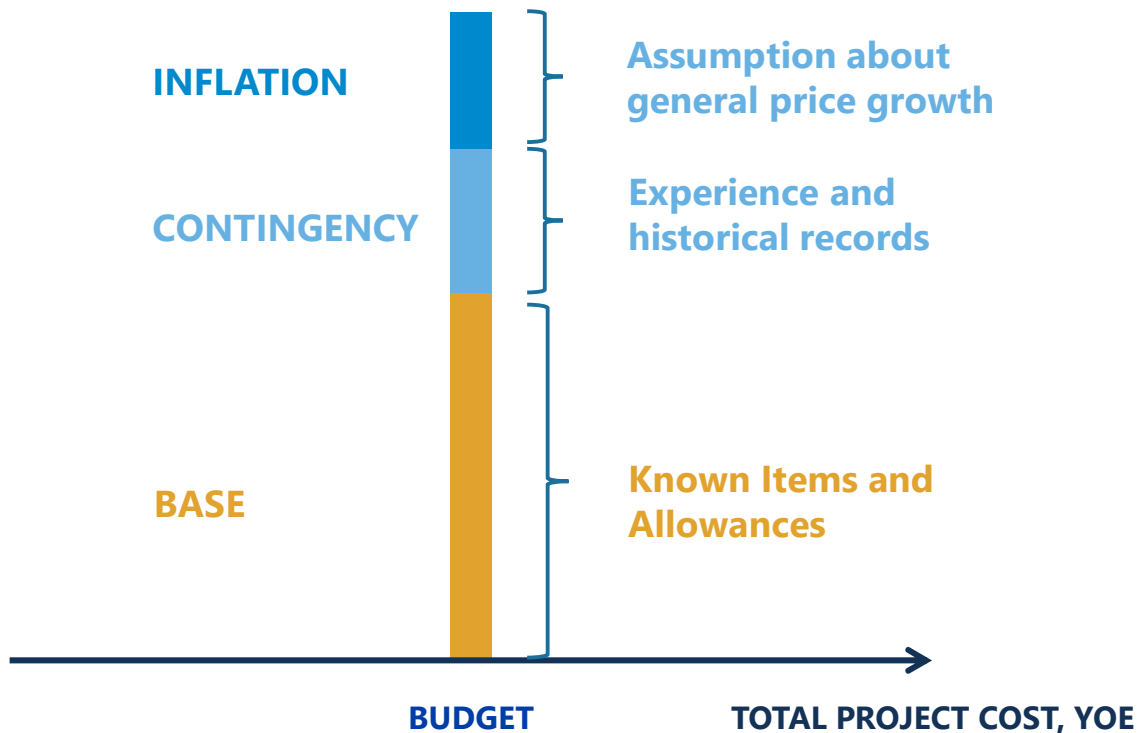
Key Takeaway

A probabilistic estimate does not predict one future. It describes the range of futures we should be prepared for.

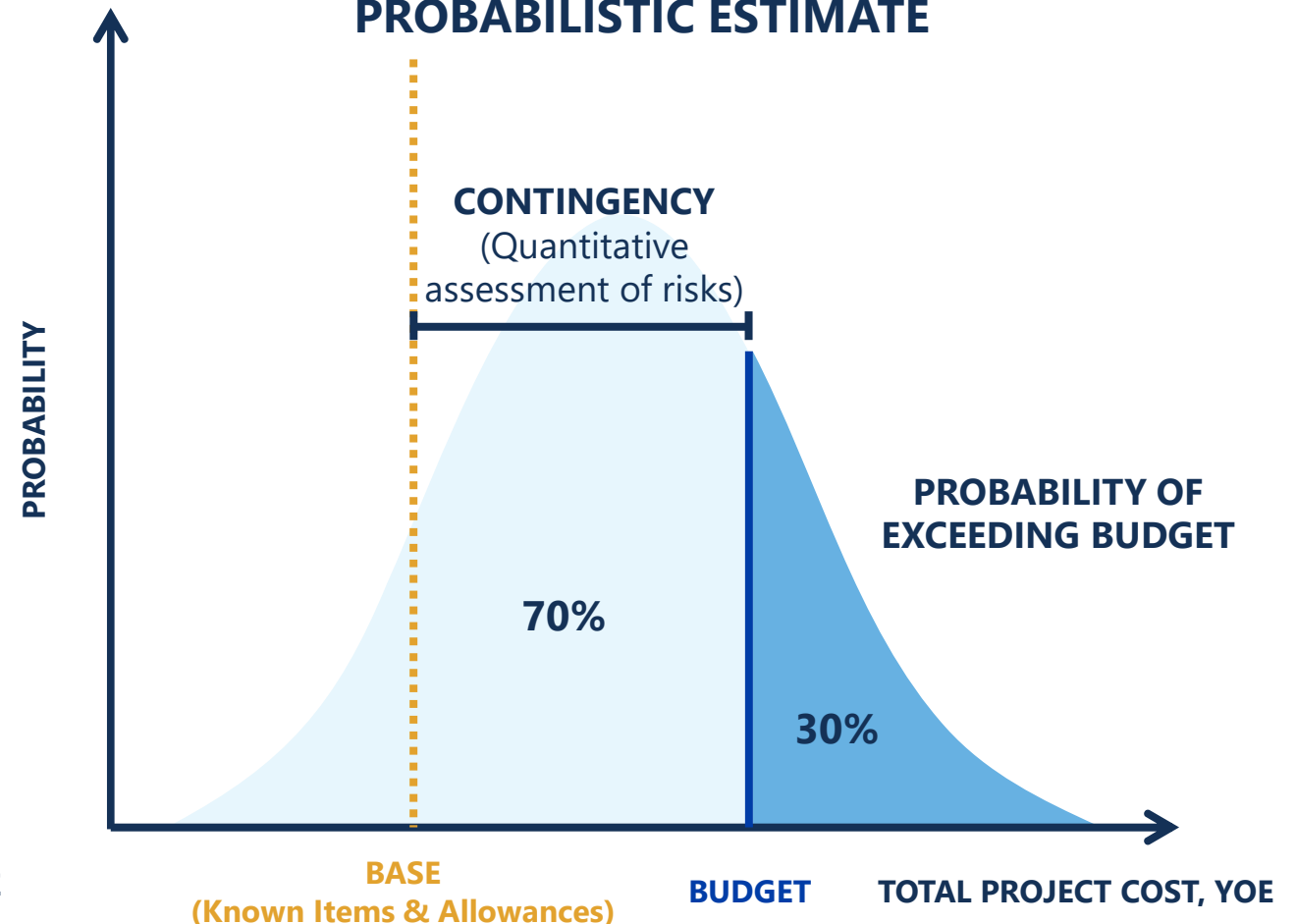


Traditional estimating selects contingency. Risk-based estimating derives it.

DETERMINISTIC ESTIMATE



PROBABILISTIC ESTIMATE



But risk can be managed:

- Identified
- Quantified
- Allocated
- Mitigated
- Monitored
- Funded

Risk management does not remove uncertainty. It prepares the project to live with it.

1. Contingency does not remove risk.

- It funds the potential impacts that may affect the project.

2. Contingency is not waste.

- It is preparation for uncertainty, not padding or hidden scope.

3. Precision creates false confidence.

- A single number can appear certain when the future is not.

4. Hope is not contingency.

- Optimism may support the plan, but it cannot fund risk.

5. Contingency exists because we do not know.

- It is not there because we know something bad will happen. It is there because we do not know what will happen.

Contingency is the funded recognition that the future may not follow the estimate.

The estimator's role is not to make uncertainty disappear.

It is to make uncertainty visible enough that leaders can make defensible decisions.

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