

Physics, Mathematics and Science Data Quality Checklist - Compare Method Alternatives

Physics, Mathematics and Science | Compare Method Alternatives | Asset ID TJ-06-04-19

A model is only as reliable as its assumptions and data. Validate units, applicability and uncertainty before using a result outside learning or exploration.

Purpose and working method

This independent, printable companion helps you make variables, units, models and uncertainty visible in a repeatable solution while working toward one outcome: choose a method that fits the data, stakes and skill available. Use a suitable calculator or utility for computation, then use these pages to preserve meaning, assumptions, checks and decisions. A number alone is not a decision record; a useful record shows where the inputs came from, why the method fits and what would make the result unsafe or misleading.

Project snapshot	Record
Project or question	_____
Prepared by / date	_____
Decision owner	_____
Intended outcome	Compare Method Alternatives
Tool or method used	Name and version/date: _____
Authoritative source	Title, owner and access date: _____
Review deadline	_____

Domain readiness map

#	Input area	Current state	Trace
1	Question and hypothesis	Known / estimated / missing	Source: _____
2	Known values	Known / estimated / missing	Source: _____
3	Unknown values	Known / estimated / missing	Source: _____
4	Units and scale	Known / estimated / missing	Source: _____
5	Model assumptions	Known / estimated / missing	Source: _____
6	Expected range	Known / estimated / missing	Source: _____

Data Quality Checklist

This working page applies the data quality checklist format to compare method alternatives. Complete it before polishing a conclusion. The useful evidence is applicability, evidence needs, failure modes and review; the governing rule is: prefer the simplest method that meets the decision need.

Quality check	Method	Finding	Action
Question and hypothesis	test whether the data is fit for this decision	_____	_____
Known values	test whether the data is fit for this decision	_____	_____
Unknown values	test whether the data is fit for this decision	_____	_____
Units and scale	test whether the data is fit for this decision	_____	_____
Model assumptions	test whether the data is fit for this decision	_____	_____
Expected range	test whether the data is fit for this decision	_____	_____

Completion standard

- Write real units, dates and source owners; avoid labels such as normal, typical or standard without a definition.
- Mark estimates as estimates. Record a range when a single value would imply false precision.
- Keep an untouched copy of source data and give every working version a date or revision.
- Record contrary evidence. A workbook that only supports the preferred answer is not a reliable check.
- Remove personal, confidential or security-sensitive details that are unnecessary for the decision.

Input and Data Map

Privacy gate: minimise personal, confidential and security-sensitive information. If a value can identify a person, account, location or protected system, use an approved environment and retention rule.

#	Data element	Minimum validation	Source	Status
1	Question and hypothesis	identity and date	Owner: _____	Ready / gap
2	Known values	definition and unit	Owner: _____	Ready / gap
3	Unknown values	range and precision	Owner: _____	Ready / gap
4	Units and scale	missing-value rule	Owner: _____	Ready / gap
5	Model assumptions	consistency with peers	Owner: _____	Ready / gap
6	Expected range	fitness for the decision	Owner: _____	Ready / gap

Transformation trail

Stage	Question	Record
Raw input	What arrived before cleaning or conversion?	Location / version: _____
Cleaning	What was removed, repaired or standardised?	Rule: _____
Conversion	Which units, formats or scales changed?	Before / after: _____
Derivation	Which values were calculated from others?	Method: _____
Exclusion	Which records or conditions were left out?	Reason: _____
Final input	What exact dataset or values entered the tool?	Hash / version: _____

Spot-check sample

Sample	Original	Working value	Comparison	Decision
1	Source: _____	Prepared: _____	Difference: _____	Accept / correct
2	Source: _____	Prepared: _____	Difference: _____	Accept / correct
3	Source: _____	Prepared: _____	Difference: _____	Accept / correct
4	Source: _____	Prepared: _____	Difference: _____	Accept / correct

Compare Method Alternatives Action Workbook

Use this page to choose a method that fits the data, stakes and skill available. The aim is not to fill every blank; it is to expose the few facts that could change the decision. The evidence package should contain applicability, evidence needs, failure modes and review.

Action field	Prompt	Record
Decision to support	What choice or action will this work inform?	_____
Audience	Who must understand or approve it?	_____
Success measure	What observable result would count as useful?	_____
Decision date	When is evidence needed, and why then?	_____
Critical assumption	Which belief could reverse the conclusion?	_____
Missing evidence	What is the most important current gap?	_____
Stop condition	What result requires pause or escalation?	_____

Outcome-specific plan

Step	Required action	Record
1. Frame	Restate compare method alternatives as a question	Owner / due: _____
2. Gather	Collect applicability, evidence needs, failure modes and review	Owner / due: _____
3. Calculate	Use inputs from question and hypothesis and known values	Method / version: _____
4. Challenge	Test model assumptions and expected range	Reviewer: _____
5. Decide	Prefer the simplest method that meets the decision need	Decision: _____

One-sentence brief

We need to decide _____ by _____. The current evidence suggests _____, but the decision could change if _____. The next owner is _____.

Assumption and Source Register

Source gate: an online result is not automatically authoritative. Record the original owner, document or dataset, publication or revision date, access date and the exact field used. Recheck time-sensitive values before publication or commitment.

ID	Item	Evidence class	Trace	Decision impact
A1	Question and hypothesis	Fact / estimate / assumption	Source: _____	Low / med / high
A2	Known values	Fact / estimate / assumption	Source: _____	Low / med / high
A3	Unknown values	Fact / estimate / assumption	Source: _____	Low / med / high
A4	Units and scale	Fact / estimate / assumption	Source: _____	Low / med / high
A5	Model assumptions	Fact / estimate / assumption	Source: _____	Low / med / high
A6	Expected range	Fact / estimate / assumption	Source: _____	Low / med / high

Units, dates and versions

Control	Review question	Record
Units	Are symbols and conversion factors explicit?	Checked by: _____
Time basis	Instant, daily, monthly, annual or lifecycle?	Basis: _____
Currency / locale	Currency, tax location and rounding rule?	Basis: _____
Version	Which tool, formula, policy or data revision?	Version: _____
Applicability	Why does the method fit this case?	Reason: _____
Exclusions	What important factor is outside the model?	Record: _____

Assumption challenge

- What direct evidence would replace the largest assumption?
- Which assumption is both uncertain and capable of changing the decision?
- Would an independent person interpret every field the same way?
- Has a current authoritative source been checked for rates, limits, laws, standards or safety boundaries?
- Who is qualified to approve this use of the result?

Scenario Comparison Matrix

Scenario work reveals whether compare method alternatives stays stable or depends on a narrow assumption. Change a driver deliberately, retain the same definitions and explain why each value is credible. Do not label an optimistic case as expected simply because it is preferred.

Driver	Low / adverse	Working case	High / favourable	Reason
Question and hypothesis	Conservative: _____	Expected: _____	Stretch: _____	Source: _____
Known values	Conservative: _____	Expected: _____	Stretch: _____	Source: _____
Unknown values	Conservative: _____	Expected: _____	Stretch: _____	Source: _____
Units and scale	Conservative: _____	Expected: _____	Stretch: _____	Source: _____
Model assumptions	Conservative: _____	Expected: _____	Stretch: _____	Source: _____
Expected range	Conservative: _____	Expected: _____	Stretch: _____	Source: _____

Outcome comparison

Comparison	Conservative	Expected	Stretch
Calculated result	_____	_____	_____
Time implication	_____	_____	_____
Cost or resource implication	_____	_____	_____
Quality or performance effect	_____	_____	_____
Risk and reversibility	_____	_____	_____
Evidence confidence	Low / medium / high	Low / medium / high	Low / medium / high

Sensitivity note

The conclusion changes most when _____ moves from _____ to _____. That driver is supported by _____. Before commitment, we will _____.

Verification and Decision Gate

High-stakes gate: A model is only as reliable as its assumptions and data. Validate units, applicability and uncertainty before using a result outside learning or exploration. For any consequential use, a qualified professional must verify the current authoritative source, inputs, method and limits. A completed workbook does not grant legal, financial, medical, engineering, laboratory, security, operational or safety approval.

Gate	Acceptance condition	Status	Evidence
Input trace	Every critical value has a source, date and unit	Pass / gap	_____
Independent check	A second method or reviewer could expose an error	Pass / gap	_____
Applicability	The method fits the case and stated boundary	Pass / gap	_____
Range	A plausible low and high case has been tested	Pass / gap	_____
Contrary evidence	Conflicts are recorded and explained	Pass / gap	_____
Privacy and rights	Sensitive and third-party material is controlled	Pass / gap	_____
Qualified review	Required professional or authorised review is complete	Pass / gap	_____

Decision record

Decision field	Choice	Record
Recommendation	Proceed / revise / pause / reject	Reason: _____
Confidence	Low / medium / high	Evidence: _____
Conditions	What must stay true?	Record: _____
Reversal trigger	What new evidence reopens the decision?	Record: _____
Owner and approval	Who owns the decision and its limits?	Name/date: _____

Final rule

For compare method alternatives, prefer the simplest method that meets the decision need. Record the decision separately from the calculation so a later reviewer can distinguish evidence, interpretation, approval and action.

Handover, Reuse and Follow-Up

Close the record so another person can reproduce the work, understand the limits and continue compare method alternatives without relying on memory. Keep the smallest useful evidence package, protect sensitive information and give the final file a clear version.

Handover field	Record
Current conclusion	_____
Evidence location	Folder, record or reference: _____
Open question	_____
Decision condition	_____
Next action / owner	_____
Review date	_____
Retention / privacy	Keep until _____; access: _____

Reuse checklist

Reuse gate	Question	Status
Definitions	Are the meanings of question and hypothesis and known values unchanged?	Yes / update
Sources	Are rates, limits, data and guidance still current?	Yes / update
Context	Does the new case share the same scope and conditions?	Yes / update
Method	Is the chosen tool or method still applicable?	Yes / update
Review	Has the right qualified or authorised person checked it?	Yes / update
Version	Has the reused record received a new date and identifier?	Yes / update

30-day learning loop

- Compare the expected result with what actually happened.
- Record whether an assumption, input definition or method caused avoidable rework.
- Improve one shared field or check; do not add process that supports no decision.
- Archive the final decision, not every unnecessary draft.

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