🧪 MU Test Log — Test 9 (Non-degenerate Action Costs)

Parameters

- $\hbar$ = 0.1
- γ = 1.0
- Paths:
  - Slow: r_slow(t) = 0.25·t
  - Fast: r_fast(t) = 0.6 + 0.35·t (tilted, higher cost Q_fast > Q_slow)
- β = 8.0 → 10.0 (step = 0.25)
- Selector: $T(r) = \frac{1}{1 + |r - r_c|}$, $r_c = 0.25$

Results (Console Highlights)

```
--- beta=8.00 ---
Q_slow=0.031250, Q_fast=0.061250
QT_slow=0.892574, QT_fast=0.658639
w_slow=7.5074e+30, w_fast=4.1444e+22
**Coexistence**
--- beta=8.25 ---
Q_slow=0.031250, Q_fast=0.061250
QT_slow=0.892574, QT_fast=0.658639
w_slow=6.9918e+31, w_fast=2.1506e+23
**Coexistence**
--- beta=8.50 ---
Q_slow=0.031250, Q_fast=0.061250
QT_slow=0.892574, QT_fast=0.658639
w_slow=6.5116e+32, w_fast=1.1160e+24
**Coexistence**
--- beta=8.75 ---
Q_slow=0.031250, Q_fast=0.061250
QT_slow=0.892574, QT_fast=0.658639
w_slow=6.0644e+33, w_fast=5.7914e+24
**Coexistence**
--- beta=9.00 ---
Q_slow=0.031250, Q_fast=0.061250
QT_slow=0.892574, QT_fast=0.658639
w_slow=5.6479e+34, w_fast=3.0053e+25
**Coexistence**
--- beta=9.25 ---
Q_slow=0.031250, Q_fast=0.061250
QT_slow=0.892574, QT_fast=0.658639
w_slow=5.2600e+35, w_fast=1.5596e+26
**Coexistence**
--- beta=9.50 ---
Q_slow=0.031250, Q_fast=0.061250
QT_slow=0.892574, QT_fast=0.658639
w_slow=4.8988e+36, w_fast=8.0930e+26
**Coexistence**
--- beta=9.75 ---
Q_slow=0.031250, Q_fast=0.061250
QT_slow=0.892574, QT_fast=0.658639
w_slow=4.5624e+37, w_fast=4.1997e+27
**Coexistence**
```

```
--- beta=10.00 ---
Q_slow=0.031250, Q_fast=0.061250
QT_slow=0.892574, QT_fast=0.658639
w_slow=4.2490e+38, w_fast=2.1793e+28
**Coexistence**
```

- **Action costs differ:**
  - Q_slow = 0.03125
  - Q_fast = 0.06125
- **Selector values differ:**
  - QT_slow = 0.892574
  - QT_fast = 0.658639
- For every β tested:
  - **w_slow** grows exponentially with β (~10^{30} → 10^{38}).
  - **w_fast** also grows exponentially, but is ~10^{8} orders of magnitude smaller than w_slow.
- Every step labeled as **Coexistence** (both weights non-zero and macroscopic).

Interpretation

- Prediction was wrong: we expected unique survival of slow, but instead both survived.
- Even with Q_fast > Q_slow, the Truth-selector **still amplifies both**.
- But: the gap between slow and fast is **astronomical** (10^{8} difference), so while coexistence exists mathematically, in practice the slow branch utterly dominates.

Why This Matters

- **Degeneracy (Test 8):** both survive almost equally → **true multi-dimensional coexistence**.
- **Non-degeneracy (Test 9):** both survive, but slow vastly outweighs → **hierarchical coexistence**.
- This means MU doesn't enforce strict collapse to one path; instead, it produces a **landscape of weighted realities**, where weaker ones survive in the background.
- That's very close to a **many-worlds interpretation** — except guided by T, not by blind probability.

Highlights

- **Truth doesn't kill paths, it suppresses them by weight.**
- Even "losing" branches exist — but their influence is tiny compared to the winning one.
- This changes our picture: MU predicts a **hierarchy of coexisting branches**, not just a winner-take-all.
- That's a **major discovery** for the model: selection is not binary, but weighted continuous.

Next Steps

1. **Zoom in on ratios**: explicitly track $w_{\text{fast}}/w_{\text{slow}}$wfast/wslow across β.
    - Expect exponential suppression.
    - Would give us a "branch hierarchy law."
2. **Physical analogy**: this matches quantum decoherence — smaller branches don't vanish, they just become irrelevant.
3. **Test 10 idea**: Vary Q_fast – Q_slow gap systematically.
    - Small gap → coexistence nearly equal (like degeneracy).
    - Large gap → coexistence becomes extreme suppression.

✅ **Conclusion**:
Test 9 shows MU selection is **not collapse, but hierarchy**. Even losing branches persist at minuscule weight. This could be the mathematical root of "shadow branches" in multidimensionality — weak but still real.