IAM Validation Suite: Reproducibility Guide

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1 Quick Start (60 seconds)

1.1 Requirements

- Python 3.7 or higher
- Internet connection (for cloning repository)

1.2 One-Command Execution

Open terminal and run:

```
git clone https://github.com/hmahaffeyges/IAM-Validation.git && cd IAM-
    Validation && pip install numpy scipy matplotlib astropy && python tests/
    test_03_final.py
```

1.3 Expected Output

```
========================================
   IAM VALIDATION - FINAL TEST
========================================

Test 1: Hubble Constant Prediction
  H0_CMB (input)  = 67.40 km/s/Mpc
  H0_IAM (predicted) = 73.22 km/s/Mpc
  H0_SH0ES (observed) = 73.04 +/- 1.04 km/s/Mpc
  Difference: 0.18 km/s/Mpc (0.17 sigma)
  Status:  PASS

Test 2: Growth Factor Fit
  chi2_LCDM = 41.15
  chi2_IAM  = 38.71
  Delta_chi2 = +2.44
  Status:  PASS

Test 3: Combined Fit (BAO + fsigma8)
  chi2_LCDM = 72.01
  chi2_IAM  = 12.43
  Delta_chi2 = +59.58
  Significance: 5.7 sigma
  Status:  PASS


========================================
 ALL TESTS PASSED - IAM MODEL VALIDATED
========================================
```

2 Step-by-Step Instructions

2.1 Step 1: Clone Repository

```
git clone https://github.com/hmahaffeyges/IAM-Validation.git
cd IAM-Validation
```

2.2 Step 2: Install Dependencies

```
pip install numpy scipy matplotlib astropy
```

2.3 Step 3: Run Validation

```
python tests/test_03_final.py
```

3 Verification Checklist

After running the validation, confirm:

H prediction: IAM gives 73.22 km/s/Mpc

Growth suppression: $^2 = +2.44$ improvement

Combined fit: ^{2}_IAM $= 12.43$ vs ^{2}_CDM $= 72.01$

Significance: $^2 = 59.58$ (5.7)

All three tests show "PASS"

No error messages

4 Troubleshooting

4.1 Import Errors

Problem: `ModuleNotFoundError: No module named 'scipy'`
  Solution:

```
pip install numpy scipy matplotlib astropy
```

4.2 Git Not Found

Problem: `git: command not found`
  Solution:

- Mac: `brew install git`
- Linux: `sudo apt-get install git`
- Windows: Download from `https://git-scm.com/`

5 Data Sources

All data used in validation:

- **Planck 2020**: $H_0 = 67.4 \pm 0.5$ km/s/Mpc

- **SH0ES 2022**: $H_0 = 73.04 \pm 1.04$ km/s/Mpc

- **JWST/TRGB 2025**: $H_0 = 70.39 \pm 1.89$ km/s/Mpc

- **DESI DR2 2025**: 10 points of $f\sigma_8(z)$

6 Contact

For issues or questions:

- GitHub Issues: `https://github.com/hmahaffeyges/IAM-Validation/issues`

- Email: hmaffeyges@gmail.com

- Preprint: `https://doi.org/10.17605/OSF.IO/KCZD9`