**Test 1 (Original):** Number of outer iterations: 50 and number of inner iterations: 20. Parameters are randomized between 0.75 and 1.25 of the initial parameter values (P0). The parameters are bounded to be within P0/10 and P0\*10. The initial guesses for the regulations are such that there is no effect initially with the regulatory terms (vDNA Km inh 1E5, vDNA Km act 1E1; Tp5 Km inh. 5E4 and 2.5E3).

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| **Model\SSE** | **K/DF** | **Min SSE/AIC** | **Avg SSE/AIC** | **SSE/AIC (Avg P)** |
| **Model 1** | 6/39 | 0.195/-151.7 (Rank 6) | 0.197/-151.2 (Rank 6) | 0.197/-151.2 (Rank 6) |
| **Model 2** | 8/37 | 0.161/-171.3 (Rank 4) | 0.167/-169.7 (Rank 4) | 0.172/-168.3 (Rank 4) |
| **Model 3** | 8/37 | 0.160/-171.6 (Rank 3) | 0.161/-171.3 (Rank 3) | 0.160/-171.6 (Rank 3) |
| **Model 4** | 8/37 | 0.178/-166.8 (Rank 5) | 0.188/-164.3 (Rank 5) | 0.223/-156.7 (Rank 5) |
| **Model 5** | 10/35 | 0.150/-181.9 (Rank 2) | 0.162/-178.5 (Rank 2) | 0.177/-174.5 (Rank 2) |
| **Model 6** | 10/35 | 0.124/-190.5 (Rank 1) | 0.147/-182.8 (Rank 1) | 0.166/-177.8 (Rank 1) |

Based on what I see on SSE trends, averaging parameters on outer iterations is always leading to higher SSE, and hence may not acceptable. We should use both minimum SSE and average SSE and the corresponding parameter values for all the analyses.

Based on minimum AIC and average AIC, I rank the models in the order of better to worse as: model 6, model 5, model 3, model 2, model 4, and model 1. Even with SSE based on average parameters, the same conclusion is reached). You can also get delta\_AIC and it will give the same picture. Then you can compute probability and evidence ratio to get the same picture.

Based on minimum and average SSE, we should calculate AIC for different models, then calculate delta\_AIC between models, then probability for correctness, and evidence ratio. You can further verify conclusion based on F-Test. But we can completely ignore F-Test, as this may not provide any additional information.

Then we should go for evaluating regulatory terms and see their contributions.

**Test 2:** Number of outer iterations: 100 and number of inner iterations: 10; Parameters are randomized between 0.75 and 1.25 of the initial parameter values (P0). The parameters are bounded to be within P0/10 and P0\*10. The initial guesses for the regulations are such that there is no effect initially with the regulatory terms (vDNA Km inh 1E4, vDNA Km act 1E2; Tp5 Km inh. 5E3 and 2.5E3).

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| **Model\SSE** | **K/DF** | **Min SSE/AIC** | **Avg SSE/AIC** | **SSE/AIC (Avg P)** |
| **Model 1** | 9/36 | 0.193/-167.2 (Rank 6) | 0.197/-166.2 (Rank 6) | 0.197/-166.2 (Rank 6) |
| **Model 2** | 11/34 | 0.144/-186.6 (Rank 4) | 0.165/-180.4 (Rank 5) | 0.161/-181.4 (Rank 5) |
| **Model 3** | 11/34 | 0.159/-181.9 (Rank 5) | 0.162/-181.1 (Rank 4) | 0.160/-181.6 (Rank 4) |
| **Model 4** | 11/34 | 0.137/-188.8 (Rank 3) | 0.148/-185.2 (Rank 3) | 0.145/-186.1 (Rank 3) |
| **Model 5** | 13/33 | 0.109/-202.6 (Rank 1) | 0.128/-195.4 (Rank 1) | 0.137/-192.5 (Rank 2) |
| **Model 6** | 13/33 | 0.123/-197.1 (Rank 2) | 0.130/-194.7 (Rank 2) | 0.127/-195.8 (Rank 1) |

**Test 3:** Number of outer iterations: 200 and number of inner iterations: 10; Parameters are randomized between 0.9 and 1.1 of the initial parameter values (P0). The parameters are bounded to be within P0/5 and P0\*5. The initial guesses for the regulation parameters are such that there is no effect initially with the regulatory terms (vDNA Km inh 1E5, vDNA Km act 1E1; Tp5 Km inh 5E4 and 2.5E3).

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| **Model\SSE** | **K/DF** | **Min SSE/AIC** | **Avg SSE/AIC** | **SSE/AIC (Avg P)** |
| **Model 1** | 9/36 | 0.194/-166.9 (Rank 6) | 0.197/-166.4 (Rank 6) | 0.196/-166.4 (Rank 6) |
| **Model 2** | 11/34 | 0.154/-183.5 (Rank 3) | 0.169/-179.3 (Rank 4) | 0.179/-176.7 (Rank 3) |
| **Model 3** | 11/34 | 0.160/-181.6 (Rank 4) | 0.161/-181.4 (Rank 3) | 0.160/-181.6 (Rank 2) |
| **Model 4** | 11/34 | 0.189/-174.2 (Rank 5) | 0.195/-172.8 (Rank 5) | 0.198/-172.2 (Rank 5) |
| **Model 5** | 13/33 | 0.138/-192.1 (Rank 1) | 0.156/-186.3 (Rank 2) | 0.194/-176.6 (Rank 4) |
| **Model 6** | 13/33 | 0.151/-188.0 (Rank 2) | 0.156/-186.6 (Rank 1) | 0.163/-184.3 (Rank 1) |

**Test 4:** Number of outer iterations: 200 and number of inner iterations: 10; Parameters are randomized between 0.8 and 1.2 of the initial parameter values (P0). The parameters are bounded to be within P0/10 and P0\*10. The initial guesses for the regulation parameters are such that there is no effect initially with the regulatory terms (vDNA Km inh 1E5, vDNA Km act 1E1; Tp5 Km inh 5E4 and 2.5E3).

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| **Model\SSE** | **K/DF** | **Min SSE/AIC** | **Avg SSE/AIC** | **SSE/AIC (Avg P)** |
| **Model 1** | 9/36 | 0.192/-167.4 (Rank 6) | 0.197/-166.3 (Rank 6) | 0.196/-166.5 (Rank 6) |
| **Model 2** | 11/34 | 0.147/-185.6 (Rank 4) | 0.168/-179.4 (Rank 4) | 0.182/-175.9 (Rank 4) |
| **Model 3** | 11/34 | 0.160/-181.6 (Rank 5) | 0.162/-181.3 (Rank 3) | 0.160/-181.6 (Rank 3) |
| **Model 4** | 11/34 | 0.136/-189.0 (Rank 2) | 0.183/-175.7 (Rank 5) | 0.193/-173.3 (Rank 5) |
| **Model 5** | 13/33 | 0.123/-197.1 (Rank 1) | 0.142/-190.6 (Rank 1) | 0.165/-183.9 (Rank 2) |
| **Model 6** | 13/33 | 0.151/-188.1 (Rank 3) | 0.160/-185.4 (Rank 2) | 0.163/-184.5 (Rank 1) |