fitCTVARMx: Internal Tests

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Tests

```
#> test-fitCTVARMx-fit-ct-var-id-mx-sigma-diag
#> Running CTVAR with 12 parameters
#>
#> Beginning initial fit attempt
#> Running CTVAR with 12 parameters
#>
#>  Lowest minimum so far:   -524.218555406392
#>
#> Solution found
```

```
#>
#>  Solution found!   Final fit=-524.21856 (started at -469.9008)  (1 attempt(s):  1
valid, 0 errors)
#>  Start values from best fit:
#> -0.0384831424067758,0.812800405902159,-0.597594043133311,-0.108906179562877,-5.14321420918298e-1
#> Running CTVAR with 12 parameters
#>
#> Beginning initial fit attempt
#> Running CTVAR with 12 parameters
#>
#>  Lowest minimum so far:   -559.970202472839
#>
#> Solution found
```

```
#>
#>  Solution found!   Final fit=-559.9702 (started at -524.73301)  (1 attempt(s):  1
valid, 0 errors)
#>  Start values from best fit:
#> -0.642731984798477,1.64491601755663,-0.383427734394026,0.0192872510006784,-1.59866915554968,0.795
#>
#> Means of the estimated paramaters per individual.
#>      phi_11      phi_21      phi_31      phi_12      phi_22      phi_32
#> -0.34060756  1.22885821 -0.49051089 -0.04480946 -0.79933458  0.81415340
```

```
#>      phi_13      phi_23      phi_33    sigma_11    sigma_22    sigma_33
#> -0.02331671 -0.17581839 -0.62344732  0.08711795  0.10984300  0.09716921
#>
#> Estimated paramaters per individual.
#>           phi_11    phi_21     phi_31      phi_12        phi_22    phi_32
#> [1,] -0.03848314 0.8128004 -0.5975940 -0.10890618 -5.143214e-16 0.8330517
#> [2,] -0.64273198 1.6449160 -0.3834277  0.01928725 -1.598669e+00 0.7952551
#>          phi_13     phi_23     phi_33  sigma_11  sigma_22   sigma_33
#> [1,]  0.1211847 -0.4802568 -0.7376982 0.0944874 0.1164533 0.09159277
#> [2,] -0.1678181  0.1286201 -0.5091964 0.0797485 0.1032327 0.10274565
#> Test passed
```

```
#> Running CTVAR with 12 parameters
#>
#> Beginning initial fit attempt
#> Running CTVAR with 12 parameters
#>
#>  Lowest minimum so far:   -524.218555406389
#>
#> Solution found
```

```
#>
#>  Solution found!   Final fit=-524.21856 (started at -505.10835)  (1 attempt(s):
1 valid, 0 errors)
#>  Start values from best fit:
#> -0.0384832832188689,0.812800551902869,-0.59759393437297,-0.10890611181173,-2.03157353899272e-16,0
#> Running CTVAR with 12 parameters
#>
#> Beginning initial fit attempt
#> Running CTVAR with 12 parameters
#>
#>  Lowest minimum so far:   -559.970202472834
#>
#> Solution found
```

```
#>
#>  Solution found!   Final fit=-559.9702 (started at -549.785)  (1 attempt(s):  1
valid, 0 errors)
#>  Start values from best fit:
#> -0.642732204901684,1.64491641407151,-0.38342766643758,0.0192872887866774,-1.5986694448406,0.79525
#> Test passed
```

```
#> test-fitCTVARMx-fit-ct-var-id-mx-sigma-full-iota
#> Running CTVAR with 21 parameters
#>
#> Beginning initial fit attempt
```

```
#> Running CTVAR with 21 parameters
#>
#>  Lowest minimum so far:   -526.372544731396
#>  Not all eigenvalues of the Hessian are positive:  6314789.60275874, 5693381.09289614,
3739654.81122722, 26403.3564978077, 19364.1504338733, 17036.5397459958, 4270.58451397246,
3232.64238000432, 2479.28968518586, 407.206752313281, 328.89929470117, 272.151488804425,
67.3692185513961, 53.998762548331, 45.1713616774425, 18.9246542705007, 14.8217229004292,
12.3845726921802, 2.97045333194162e-12, 3.48224884497545e-13, -1.04360515662839e-13
#>
#> Beginning fit attempt 1 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>  Not all eigenvalues of the Hessian are positive:  6314789.60275874, 5693381.09289614,
3739654.81122722, 26403.3564978077, 19364.1504338733, 17036.5397459958, 4270.58451397246,
3232.64238000432, 2479.28968518586, 407.206752313281, 328.89929470117, 272.151488804425,
67.3692185513961, 53.998762548331, 45.1713616774425, 18.9246542705007, 14.8217229004292,
12.3845726921802, 2.97045333194162e-12, 3.48224884497545e-13, -1.04360515662839e-13
#>
#> Beginning fit attempt 2 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 3 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 4 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 5 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 6 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 7 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
```

```
#>
#> Beginning fit attempt 8 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 9 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Lowest minimum so far:   -526.372544734482
#>  Not all eigenvalues of the Hessian are positive:  6314756.78771169, 5693426.66568649,
3739676.14397258, 26403.2239249462, 19364.1978433281, 17036.6292682905, 4270.61085704584,
3232.66381037379, 2479.27862952607, 407.199397811252, 328.905335823489, 272.158326637596,
67.3760563088724, 54.0034807458622, 45.1786525842488, 18.9271467255912, 14.827680645865,
12.3943990477248, 7.81389095850082e-13, 2.78729200515284e-15, -9.67585234230219e-13
#>
#> Beginning fit attempt 10 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Lowest minimum so far:   -526.372544734483
#>
#> Solution found
```

```
#>
#>  Solution found!   Final fit=-526.37254 (started at 45.578809)  (11 attempt(s):
4 valid, 7 errors)
#>  Start values from best fit:
#> -0.0400077969493237,0.834105047045331,-0.579940702990934,-0.109301226995022,2.2250738585072e-308,
#> Running CTVAR with 21 parameters
#>
#> Beginning initial fit attempt
#> Running CTVAR with 21 parameters
#>
#>  Lowest minimum so far:   -561.170532869142
#>
#> Solution found
```

```
#>
#>  Solution found!   Final fit=-561.17053 (started at 13.882653)  (1 attempt(s):  1
valid, 0 errors)
#>  Start values from best fit:
#> -0.677837648295549,1.69866353201792,-0.500864694662596,0.0494990267187341,-1.63285769870249,0.904

#>
#> Means of the estimated paramaters per individual.
#>        phi_11        phi_21        phi_31        phi_12        phi_22
```

```
#> -3.589227e-01  1.266384e+00 -5.404027e-01 -2.990110e-02 -8.164288e-01
#>        phi_32        phi_13        phi_23        phi_33        iota_1
#>  8.701469e-01 -2.922256e-02 -1.617745e-01 -6.303029e-01 -6.262975e-02
#>        iota_2        iota_3      sigma_11      sigma_21      sigma_22
#>  1.407981e-02 -2.344022e-01  8.729671e-02 -4.459762e-03  1.099429e-01
#>      sigma_31      sigma_32      sigma_33      theta_11      theta_22
#> -5.422987e-04 -8.231793e-03  9.129823e-02  9.750654e-18  1.753594e-16
#>      theta_33
#>  2.973805e-04
#>
#> Estimated paramaters per individual.
#>          phi_11   phi_21     phi_31      phi_12         phi_22    phi_32
#> [1,] -0.0400078 0.834105 -0.5799407 -0.10930123  2.225074e-308 0.8358987
#> [2,] -0.6778376 1.698664 -0.5008647  0.04949903  -1.632858e+00 0.9043951
#>          phi_13     phi_23     phi_33     iota_1     iota_2     iota_3
#> [1,]  0.1267901 -0.4732857 -0.7421004 -0.1252595 0.02815961 -0.4688044
#> [2,] -0.1852352  0.1497368 -0.5185054  0.0000000 0.00000000  0.0000000
#>        sigma_11     sigma_21  sigma_22     sigma_31     sigma_32   sigma_33
#> [1,] 0.09452076 -0.006693964 0.1164523 -0.007309284 -0.010580649 0.09164198
#> [2,] 0.08007266 -0.002225561 0.1034334  0.006224687 -0.005882938 0.09095448
#>           theta_11      theta_22      theta_33
#> [1,] 2.225074e-308 2.225074e-308 2.225074e-308
#> [2,]  1.950131e-17  3.507188e-16  5.947610e-04
#> Test passed
```

```
#> Running CTVAR with 21 parameters
#>
#> Beginning initial fit attempt
#> Running CTVAR with 21 parameters
#>
#>  Lowest minimum so far:   -526.372544409076
#>  Not all eigenvalues of the Hessian are positive:  6314334.20758358, 5693771.6783917,
3739361.00547314, 26401.8874847761, 19363.5861769263, 17036.083219386, 4270.74557568385,
3232.42303831181, 2479.02561472829, 407.191775343793, 328.905571118022, 272.149859031552,
67.3720557157751, 54.0007981813266, 45.1702050383515, 18.9277197180435, 14.8223901072077,
12.3844939608559, 4.94864256176387e-13, 4.73112968879965e-14, -3.3249322243917e-14
#>
#> Beginning fit attempt 1 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Lowest minimum so far:   -526.372544494746
#>
#> Solution found
```

```
#>
#>  Solution found!   Final fit=-526.37254 (started at 15.020347)  (2 attempt(s):  2
```

```
valid, 0 errors)
#>  Start values from best fit:
#> -0.0398995606162301,0.83406549029534 7,-0.579895912037261,-0.109356670919096,2.2250738585072e-308,
#> Running CTVAR with 21 parameters
#>
#> Beginning initial fit attempt
#> Running CTVAR with 21 parameters
#>
#>  Lowest minimum so far:   -561.1705328708 72
#>
#> Solution found
```

```
#>
#>  Solution found!   Final fit=-561.17053 (started at -5.5302052)  (1 attempt(s):
1 valid, 0 errors)
#>  Start values from best fit:
#> -0.677837968742847,1.69866597290849,-0.500863740599384,0.0494989953762669,-1.63285863936085,0.904
```

```
#> Test passed
```

```
#> Running CTVAR with 21 parameters
#>
#> Beginning initial fit attempt
#> Running CTVAR with 21 parameters
#>
#>  Lowest minimum so far:   -526.372544731396
#>  Not all eigenvalues of the Hessian are positive:  6314789.60275874, 5693381.09289614,
3739654.81122722, 26403.35649780 77, 19364.1504338733, 17036.5397459958, 4270.58451397246,
3232.64238000432, 2479.28968518586, 407.206752313281, 328.89929470117, 272.151488804425,
67.3692185513961, 53.998762548331, 45.17136167 74425, 18.9246542705007, 14.8217229004292,
12.3845726921802, 2.97045333194162e-12, 3.48224884497545e-13, -1.04360515662839e-13
#>
#> Beginning fit attempt 1 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>  Not all eigenvalues of the Hessian are positive:  6314789.60275874, 5693381.09289614,
3739654.81122722, 26403.35649780 77, 19364.1504338733, 17036.5397459958, 4270.58451397246,
3232.64238000432, 2479.28968518586, 407.206752313281, 328.89929470117, 272.151488804425,
67.3692185513961, 53.998762548331, 45.17136167 74425, 18.9246542705007, 14.8217229004292,
12.3845726921802, 2.97045333194162e-12, 3.48224884497545e-13, -1.04360515662839e-13
#>
#> Beginning fit attempt 2 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 3 of at maximum 1000 extra tries
```

```
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 4 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 5 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 6 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 7 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 8 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 9 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 10 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 11 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 12 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
```

```
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 13 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 14 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 15 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 16 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 17 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 18 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 19 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 20 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 21 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
```

```
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 22 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 23 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 24 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 25 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 26 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 27 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Fit attempt generated errors
#>
#> Beginning fit attempt 28 of at maximum 1000 extra tries
#> Running CTVAR with 21 parameters
#>
#>  Lowest minimum so far:   -526.372544734446
#>
#> Solution found
```

```
#>
#>  Solution found!   Final fit=-526.37254 (started at 45.578809)  (29 attempt(s):
3 valid, 26 errors)
#>  Start values from best fit:
#> -0.040008409682211 8,0.834105161555209,-0.579940705616418,-0.109300540031238,2.2250738585072e-308,
```

```
#> Running CTVAR with 21 parameters
#>
#> Beginning initial fit attempt
#> Running CTVAR with 21 parameters
#>
#>  Lowest minimum so far:   -561.170532869142
#>
#> Solution found
```

```
#>
#>  Solution found!   Final fit=-561.17053 (started at 13.882653)  (1 attempt(s):  1
valid, 0 errors)
#>  Start values from best fit:
#> -0.677837648295549,1.69866353201792,-0.500864694662596,0.0494990267187341,-1.63285769870249,0.90
#> test-fitCTVARMx-fit-ct-var-id-mx-sigma-full
#> Running CTVAR with 15 parameters
#>
#> Beginning initial fit attempt
#> Running CTVAR with 15 parameters
#>
#>  Lowest minimum so far:   -526.37254473443
#>
#> Solution found
```

```
#>
#>  Solution found!   Final fit=-526.37254 (started at -469.9008)  (1 attempt(s):  1
valid, 0 errors)
#>  Start values from best fit:
#> -0.0400076924431331,0.8341054747227726,-0.579941168825472,-0.109301141188417,2.2250738585072e-308
#> Running CTVAR with 15 parameters
#>
#> Beginning initial fit attempt
#> Running CTVAR with 15 parameters
#>
#>  Lowest minimum so far:   -560.908732339046
#>
#> Solution found
```

```
#>
#>  Solution found!   Final fit=-560.90873 (started at -524.73301)  (1 attempt(s):
1 valid, 0 errors)
#>  Start values from best fit:
#> -0.666851281700055,1.70449639871362,-0.562532442949386,0.0424175071771889,-1.63676296621656,0.95

#>
```

```
#> Means of the estimated paramaters per individual.
#>        phi_11        phi_21        phi_31        phi_12        phi_22
#> -0.3534294871  1.2693009367 -0.5712368059 -0.0334418170 -0.8183814831
#>        phi_32        phi_13        phi_23        phi_33      sigma_11
#>  0.8956494175 -0.0257088810 -0.1599705062 -0.6471484142  0.0872560190
#>      sigma_21      sigma_22      sigma_31      sigma_32      sigma_33
#> -0.0044724472  0.1100599358 -0.0009240652 -0.0096000289  0.0973692748
#>
#> Estimated paramaters per individual.
#>           phi_11    phi_21     phi_31      phi_12         phi_22    phi_32
#> [1,] -0.04000769 0.8341055 -0.5799412 -0.10930114  2.225074e-308 0.8358991
#> [2,] -0.66685128 1.7044964 -0.5625324  0.04241751  -1.636763e+00 0.9553997
#>          phi_13    phi_23     phi_33   sigma_11     sigma_21  sigma_22
#> [1,]  0.1267900 -0.473286 -0.7421010 0.09452072 -0.006693963 0.1164523
#> [2,] -0.1782078  0.153345 -0.5521958 0.07999132 -0.002250932 0.1036676
#>          sigma_31     sigma_32   sigma_33
#> [1,] -0.007309297 -0.010580650 0.09164205
#> [2,]  0.005461166 -0.008619408 0.10309650
#> Test passed

#> Running CTVAR with 15 parameters
#>
#> Beginning initial fit attempt
#> Running CTVAR with 15 parameters
#>
#>  Lowest minimum so far:   -526.372544734471
#>
#> Solution found
```

```
#>
#>  Solution found!   Final fit=-526.37254 (started at -505.10835)  (1 attempt(s):
1 valid, 0 errors)
#>  Start values from best fit:
#> -0.0400075759949649,0.834105227444661,-0.579941056579078,-0.109301334267454,2.2250738585072e-308,
#> Running CTVAR with 15 parameters
#>
#> Beginning initial fit attempt
#> Running CTVAR with 15 parameters
#>
#>  Lowest minimum so far:   -560.908732339043
#>
#> Solution found
```

```
#>
#>  Solution found!   Final fit=-560.90873 (started at -549.785)  (1 attempt(s):  1
valid, 0 errors)
```

```
#>  Start values from best fit:
#> -0.666851435172451,1.70449661971283,-0.562532590288391,0.0424176092148328,-1.63676291433942,0.955

#> Test passed

#> test-fitCTVARMx-fit-ct-var-id-mx-theta-diag
#> Running CTVAR with 15 parameters
#>
#> Beginning initial fit attempt
#> Running CTVAR with 15 parameters
#>
#>  Lowest minimum so far:   -524.36743585852
#>
#> Solution found
```

```
#>
#>  Solution found!   Final fit=-524.36744 (started at 45.578809)  (1 attempt(s):  1
valid, 0 errors)
#>  Start values from best fit:
#> -0.0392196975057307,0.813122906567035,-0.593693014739551,-0.108212382263372,2.2250738585072e-308,
#> Running CTVAR with 15 parameters
#>
#> Beginning initial fit attempt
#> Running CTVAR with 15 parameters
#>
#>  Lowest minimum so far:   -560.449739070489
#>
#> Solution found
```

```
#>
#>  Solution found!   Final fit=-560.44974 (started at 13.882653)  (1 attempt(s):  1
valid, 0 errors)
#>  Start values from best fit:
#> -0.648628550992624,1.64581841929377,-0.343004038798861,0.0227999759180989,-1.59863975713676,0.775

#>
#> Means of the estimated paramaters per individual.
#>        phi_11        phi_21        phi_31        phi_12        phi_22
#> -3.439241e-01  1.229471e+00 -4.683485e-01 -4.270620e-02 -7.993199e-01
#>        phi_32        phi_13        phi_23        phi_33      sigma_11
#>  8.006183e-01 -2.583282e-02 -1.754315e-01 -6.022583e-01  8.718153e-02
#>      sigma_22      sigma_33      theta_11      theta_22      theta_33
#>  1.095926e-01  8.606131e-02  2.009293e-22  8.199484e-22  5.542973e-04
#>
#> Estimated paramaters per individual.
#>          phi_11    phi_21    phi_31      phi_12         phi_22    phi_32
```

```
#> [1,] -0.0392197 0.8131229 -0.593693 -0.10821238  2.225074e-308 0.8257233
#> [2,] -0.6486286 1.6458184 -0.343004  0.02279998  -1.598640e+00 0.7755134
#>          phi_13     phi_23     phi_33   sigma_11  sigma_22   sigma_33
#> [1,]  0.1202468 -0.4802755 -0.7267471 0.09460248 0.1161697 0.08341591
#> [2,] -0.1719124  0.1294124 -0.4777695 0.07976059 0.1030156 0.08870670
#>           theta_11      theta_22     theta_33
#> [1,] 2.225074e-308 2.225074e-308 0.0004114894
#> [2,]  4.018587e-22  1.639897e-21 0.0006971052
#> Test passed
```

```
#> Running CTVAR with 15 parameters
#>
#> Beginning initial fit attempt
#> Running CTVAR with 15 parameters
#>
#>  Lowest minimum so far:   -524.3673771997 29
#>  OpenMx status code 6 not in list of acceptable status codes, (0,0)
#>
#> Beginning fit attempt 1 of at maximum 1000 extra tries
#> Running CTVAR with 15 parameters
#>
#>  Lowest minimum so far:   -524.36743580039
#>
#> Solution found
```

```
#>
#>  Solution found!   Final fit=-524.36744 (started at 15.020347)  (2 attempt(s):  2
valid, 0 errors)
#>  Start values from best fit:
#> -0.0393397150430666,0.812970450231768,-0.593461310428315,-0.108173421191402,-2.79389813490541e-20
#> Running CTVAR with 15 parameters
#>
#> Beginning initial fit attempt
#> Running CTVAR with 15 parameters
#>
#>  Lowest minimum so far:   -560.449739069956
#>
#> Solution found
```

```
#>
#>  Solution found!   Final fit=-560.44974 (started at -5.5302052)  (1 attempt(s):
1 valid, 0 errors)
#>  Start values from best fit:
#> -0.64862912951774,1.64581981809714,-0.343001328371216,0.0228004211424888,-1.59864140686751,0.7755
```

```
#> Test passed
```

```
#> test-fitCTVARMx-fit-ct-var-id-mx-theta-null
#> Running CTVAR with 12 parameters
#>
#> Beginning initial fit attempt
#> Running CTVAR with 12 parameters
#>
#>  Lowest minimum so far:   -524.218555406392
#>
#> Solution found
```

```
#>
#>  Solution found!   Final fit=-524.21856 (started at -469.9008)  (1 attempt(s):  1
valid, 0 errors)
#>  Start values from best fit:
#> -0.0384831424067758,0.812800405902159,-0.597594043133311,-0.108906179562877,-5.14321420918298e-16
#> Running CTVAR with 12 parameters
#>
#> Beginning initial fit attempt
#> Running CTVAR with 12 parameters
#>
#>  Lowest minimum so far:   -559.970202472839
#>
#> Solution found
```

```
#>
#>  Solution found!   Final fit=-559.9702 (started at -524.73301)  (1 attempt(s):  1
valid, 0 errors)
#>  Start values from best fit:
#> -0.642731984798477,1.64491601755663,-0.383427734394026,0.0192872510006784,-1.59866915554968,0.795

#>
#> Means of the estimated paramaters per individual.
#>      phi_11      phi_21      phi_31      phi_12      phi_22      phi_32
#> -0.34060756  1.22885821 -0.49051089 -0.04480946 -0.79933458  0.81415340
#>      phi_13      phi_23      phi_33    sigma_11    sigma_22    sigma_33
#> -0.02331671 -0.17581839 -0.62344732  0.08711795  0.10984300  0.09716921
#>
#> Estimated paramaters per individual.
#>           phi_11    phi_21     phi_31      phi_12        phi_22    phi_32
#> [1,] -0.03848314 0.8128004 -0.5975940 -0.10890618 -5.143214e-16 0.8330517
#> [2,] -0.64273198 1.6449160 -0.3834277  0.01928725 -1.598669e+00 0.7952551
#>          phi_13     phi_23     phi_33  sigma_11  sigma_22   sigma_33
#> [1,]  0.1211847 -0.4802568 -0.7376982 0.0944874 0.1164533 0.09159277
#> [2,] -0.1678181  0.1286201 -0.5091964 0.0797485 0.1032327 0.10274565
#> Test passed
```

```
#> Running CTVAR with 12 parameters
#>
#> Beginning initial fit attempt
#> Running CTVAR with 12 parameters
#>
#>  Lowest minimum so far:   -524.218555406389
#>
#> Solution found
```

```
#>
#>  Solution found!   Final fit=-524.21856 (started at -505.10835)  (1 attempt(s):
1 valid, 0 errors)
#>  Start values from best fit:
#> -0.0384832832188689,0.812800551902869,-0.59759393437297,-0.10890611181173,-2.03157353899272e-16,0
#> Running CTVAR with 12 parameters
#>
#> Beginning initial fit attempt
#> Running CTVAR with 12 parameters
#>
#>  Lowest minimum so far:   -559.970202472834
#>
#> Solution found
```

```
#>
#>  Solution found!   Final fit=-559.9702 (started at -549.785)  (1 attempt(s):  1
valid, 0 errors)
#>  Start values from best fit:
#> -0.642732204901684,1.64491641407151,-0.38342766643758,0.0192872887866774,-1.5986694448406,0.79525
```

```
#> Test passed
```

```
#> test-fitCTVARMx-fit-ct-var-mx-theta-null
#> Running CTVAR with 12 parameters
#>
#> Beginning initial fit attempt
#> Running CTVAR with 12 parameters
#>
#>  Lowest minimum so far:   -1157.20358246445
#>
#> Solution found
```

```
#>
#>  Solution found!   Final fit=-1157.2036 (started at -1076.798)  (1 attempt(s):  1
valid, 0 errors)
#>  Start values from best fit:
#> -0.0502683127453872,0.6604328106315,-0.81642594205769,-0.214239295434563,-0.300531581970456,0.780
```

```
#> Summary of CTVAR
#>
#> free parameters:
#>        name        matrix  row  col    Estimate   Std.Error A
#> 1    phi_11   CTVAR_1.phi eta1 eta1 -0.05026831 0.205134398
#> 2    phi_21   CTVAR_1.phi eta2 eta1  0.66043281 0.214949378
#> 3    phi_31   CTVAR_1.phi eta3 eta1 -0.81642594 0.208145903
#> 4    phi_12   CTVAR_1.phi eta1 eta2 -0.21423930 0.146527401
#> 5    phi_22   CTVAR_1.phi eta2 eta2 -0.30053158 0.155595184
#> 6    phi_32   CTVAR_1.phi eta3 eta2  0.78652341 0.149942926
#> 7    phi_13   CTVAR_1.phi eta1 eta3  0.27755137 0.103990691
#> 8    phi_23   CTVAR_1.phi eta2 eta3 -0.05509869 0.110111373
#> 9    phi_33   CTVAR_1.phi eta3 eta3 -0.62168583 0.106649524
#> 10 sigma_11 CTVAR_1.sigma eta1 eta1  0.07883831 0.008094810
#> 11 sigma_22 CTVAR_1.sigma eta2 eta2  0.08894839 0.009038868
#> 12 sigma_33 CTVAR_1.sigma eta3 eta3  0.08332776 0.008417876
#>                  lbound               ubound
#> 1                       2.2250738585072e-308
#> 2
#> 3
#> 4
#> 5                       2.2250738585072e-308
#> 6
#> 7
#> 8
#> 9                       2.2250738585072e-308
#> 10 2.2250738585072e-308
#> 11 2.2250738585072e-308
#> 12 2.2250738585072e-308
#>
#> Model Statistics:
#>                |  Parameters  |  Degrees of Freedom  |  Fit (-2lnL units)
#>        Model:             12                    588             -1157.204
#>    Saturated:             NA                     NA                    NA
#> Independence:             NA                     NA                    NA
#> Number of observations/statistics: 200/600
#>
#> Information Criteria:
#>       |  df Penalty  |  Parameters Penalty  |  Sample-Size Adjusted
#> AIC:      -2333.204              -1133.204               -1131.535
#> BIC:      -4272.614              -1093.624               -1131.641
#> CFI: NA
#> TLI: 1   (also known as NNFI)
#> RMSEA:  0  [95% CI (NA, NA)]
#> Prob(RMSEA <= 0.05): NA
#> To get additional fit indices, see help(mxRefModels)
```

```
#> timestamp: 2024-07-26 04:57:03
#> Wall clock time: 1.243116 secs
#> optimizer:  SLSQP
#> OpenMx version number: 2.21.11
#> Need help?  See help(mxSummary)
#>
#> Summary of CTVAR
#>
#> free parameters:
#>        name        matrix  row  col    Estimate   Std.Error A
#> 1    phi_11   CTVAR_1.phi eta1 eta1 -0.05026831 0.205134398
#> 2    phi_21   CTVAR_1.phi eta2 eta1  0.66043281 0.214949378
#> 3    phi_31   CTVAR_1.phi eta3 eta1 -0.81642594 0.208145903
#> 4    phi_12   CTVAR_1.phi eta1 eta2 -0.21423930 0.146527401
#> 5    phi_22   CTVAR_1.phi eta2 eta2 -0.30053158 0.155595184
#> 6    phi_32   CTVAR_1.phi eta3 eta2  0.78652341 0.149942926
#> 7    phi_13   CTVAR_1.phi eta1 eta3  0.27755137 0.103990691
#> 8    phi_23   CTVAR_1.phi eta2 eta3 -0.05509869 0.110111373
#> 9    phi_33   CTVAR_1.phi eta3 eta3 -0.62168583 0.106649524
#> 10 sigma_11 CTVAR_1.sigma eta1 eta1  0.07883831 0.008094810
#> 11 sigma_22 CTVAR_1.sigma eta2 eta2  0.08894839 0.009038868
#> 12 sigma_33 CTVAR_1.sigma eta3 eta3  0.08332776 0.008417876
#>                  lbound               ubound
#> 1                       2.2250738585072e-308
#> 2
#> 3
#> 4
#> 5                       2.2250738585072e-308
#> 6
#> 7
#> 8
#> 9                       2.2250738585072e-308
#> 10 2.2250738585072e-308
#> 11 2.2250738585072e-308
#> 12 2.2250738585072e-308
#>
#> Model Statistics:
#>                |  Parameters  |  Degrees of Freedom  |  Fit (-2lnL units)
#>        Model:             12                   588             -1157.204
#>    Saturated:             NA                    NA                    NA
#> Independence:             NA                    NA                    NA
#> Number of observations/statistics: 200/600
#>
#> Information Criteria:
#>       |  df Penalty  |  Parameters Penalty  |  Sample-Size Adjusted
#> AIC:      -2333.204              -1133.204               -1131.535
```

```
#> BIC:      -4272.614              -1093.624                -1131.641
#> CFI: NA
#> TLI: 1   (also known as NNFI)
#> RMSEA:  0  [95% CI (NA, NA)]
#> Prob(RMSEA <= 0.05): NA
#> To get additional fit indices, see help(mxRefModels)
#> timestamp: 2024-07-26 04:57:03
#> Wall clock time: 1.243116 secs
#> optimizer:  SLSQP
#> OpenMx version number: 2.21.11
#> Need help?  See help(mxSummary)
#>
#> Test passed

#> Running CTVAR with 12 parameters
#>
#> Beginning initial fit attempt
#> Running CTVAR with 12 parameters
#>
#>  Lowest minimum so far:   -1157.20358246445
#>
#> Solution found

#>
#>  Solution found!   Final fit=-1157.2036 (started at -1137.6365)  (1 attempt(s):
1 valid, 0 errors)
#>  Start values from best fit:
#> -0.0502683086451685,0.660432815170226,-0.816425944066296,-0.214239324052436,-0.300531589633301,0

#> Test passed
#> [[1]]
#> [[1]][[1]]
#> [[1]][[1]]$value
#> [[1]][[1]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[1]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[2]]
#> [[1]][[2]]$value
#> [[1]][[2]]$value[[1]]
#>
#> Means of the estimated paramaters per individual.
```

```
#>        phi_11        phi_21        phi_31        phi_12        phi_22
#> -3.589230e-01  1.266384e+00 -5.404027e-01 -2.990076e-02 -8.164288e-01
#>        phi_32        phi_13        phi_23        phi_33        iota_1
#>  8.701470e-01 -2.922272e-02 -1.617744e-01 -6.303030e-01 -5.676427e-04
#>        iota_2        iota_3      sigma_11      sigma_21      sigma_22
#> -1.140705e-02  4.999492e-02  8.729671e-02 -4.459770e-03  1.099429e-01
#>      sigma_31      sigma_32      sigma_33      theta_11      theta_22
#> -5.422907e-04 -8.231807e-03  9.129822e-02  9.784990e-18  1.754146e-16
#>      theta_33
#>  2.973805e-04
#>
#>
#> [[1]][[2]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[3]]
#> [[1]][[3]]$value
#> [[1]][[3]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[3]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[4]]
#> [[1]][[4]]$value
#> [[1]][[4]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[4]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[5]]
#> [[1]][[5]]$value
#> [[1]][[5]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[5]]$visible
#> [1] TRUE
#>
#>
```

```
#> [[1]][[6]]
#> [[1]][[6]]$value
#> [[1]][[6]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[6]]$visible
#> [1] TRUE
```

Environment

```
ls()

#> [1] "root"
```

Class

```
#> [[1]]
#> [1] "root_criterion"
```

References

R Core Team. (2024). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. Vienna, Austria. https://www.R-project.org/