**Additional file 1: Diagonal elements of** $E\_{X}\left[D^{-1}ED^{-1}E\right]$

Elements of the matrix $P=D^{-1}ED^{-1}E$ are $P\_{kl}=\sum\_{t}^{}\frac{\left(X^{'}X-E\left[X^{'}X\right]\right)\_{kt}}{δ\_{k}}\frac{\left(X^{'}X-E\left[X^{'}X\right]\right)\_{tl}}{δ\_{t}}$

In the diagonal $P\_{kk}=\sum\_{t}^{}\frac{\left(X^{'}X-E\left[X^{'}X\right]\right)\_{kt}}{δ\_{k}}\frac{\left(X^{'}X-E\left[X^{'}X\right]\right)\_{tk}}{δ\_{t}}=\sum\_{t}^{}\frac{\left(\sum\_{i}^{}x\_{ik}x\_{it}-E\left[X^{'}X\right]\_{kt}\right)^{2}}{δ\_{k}δ\_{t}}$

$P\_{kk}=\frac{1}{δ\_{k}}\left\{\frac{1}{δ\_{k}}\left(\sum\_{i}^{}x\_{ik}^{2}-Nσ\_{k}^{2}\right)^{2}+\sum\_{t\ne k}^{}\frac{1}{δ\_{t}}\left(\sum\_{i}^{}x\_{ik}x\_{it}\right)^{2}\right\}$

The first term is $\left(\sum\_{i}^{}x\_{ik}^{2}-Nσ\_{k}^{2}\right)^{2}=\left(\sum\_{i}^{}x\_{ik}^{2}\right)^{2}-2Nσ\_{k}^{2}\left(\sum\_{i}^{}x\_{ik}^{2}\right)+N^{2}σ\_{k}^{4}$ with expectation

$E\_{X}\left[\left(\sum\_{i}^{}x\_{ik}^{2}-Nσ\_{k}^{2}\right)^{2}\right]=\sum\_{i}^{}E\_{X}\left[x\_{ik}^{4}\right]+\sum\_{i}^{}\sum\_{j\ne i}^{}E\_{X}\left[x\_{ik}^{2}\right]E\_{X}\left[x\_{jk}^{2}\right]-2Nσ\_{k}^{2}\left(\sum\_{i}^{}E\_{X}\left[x\_{ik}^{2}\right]\right)+N^{2}σ\_{k}^{4}$

It can simply be shown that$E\_{X}\left[x\_{ik}^{4}\right]=E\_{X}\left[x\_{ik}^{2}\right]=σ\_{k}^{2}$, giving

$E\_{X}\left[\left(\sum\_{i}^{}x\_{ik}^{2}-Nσ\_{k}^{2}\right)^{2}\right]=\sum\_{i}^{}σ\_{k}^{2}+\sum\_{i}^{}\sum\_{j\ne i}^{}σ\_{k}^{4}-2Nσ\_{k}^{2}\left(\sum\_{i}^{}σ\_{k}^{2}\right)+N^{2}σ\_{k}^{4}$ $=Nσ\_{k}^{2}-Nσ\_{k}^{4}$

Second term elements are such that$ E\_{X}\left[\left(\sum\_{i}^{}x\_{ik}x\_{it}\right)^{2}\right]=\sum\_{i}^{}E\_{X}\left[\left(x\_{ik}x\_{it}\right)^{2}\right]+\sum\_{i}^{}\sum\_{j\ne i}^{}E\_{X}\left[x\_{ik}x\_{it}x\_{jk}x\_{jt}\right]$, with $E\_{X}\left[x\_{ik}x\_{it}x\_{jk}x\_{jt}\right]=0$ when $t\ne k$, leaving $E\_{X}\left[\left(\sum\_{i}^{}x\_{ik}x\_{it}\right)^{2}\right]=Nσ\_{k}^{2}σ\_{t}^{2}$.

Then $E\_{X}\left[P\_{kk}\right]=\frac{1}{δ\_{k}}\left\{\frac{1}{δ\_{k}}Nσ\_{k}^{2}\left(1-σ\_{k}^{2}\right)+\sum\_{t\ne k}^{}\frac{Nσ\_{k}^{2}σ\_{f\_{t}}^{2}}{δ\_{t}}\right\}=\frac{Nσ\_{k}^{2}}{δ\_{k}}\left\{\frac{1-2σ\_{k}^{2}}{δ\_{k}}+\sum\_{t}^{}\frac{σ\_{t}^{2}}{δ\_{t}}\right\}$