Extracting Estimates from PDFs

(I) $x$ constant parameters

(a) No prior information on $x$

\[ \mu_L: \hat{x}^{\mu_L} = \arg \max_x f(z|x) \]  \hspace{1cm} (1)

(b) Prior information: $f(x)$

Full PDF - Bayes Theorem: $f(x|z) = \frac{f(z|x) f(x)}{f(z)}$

Extracting estimate:

\[ \mu_{MP}: \hat{x}^{\mu_{MP}} = \arg \max f(z|x) f(x) \]  \hspace{1cm} (2)

\[ \mu_{MSE}: \hat{x}^{\mu_{MSE}} = \arg \min E[(\hat{x} - x)^T (\hat{x} - x) | z] \]
\[ = E[x|z] \]  \hspace{1cm} (3)

(c) Prior information: $E[x], Var[x]$

- Recursive Least-Squares

\[ \hat{x}(k) = \hat{x}(k-1) + K(k) (z(k) - H(k) \hat{x}(k-1)) \]

Note: timed meas. $z(k) = H(k) x + w(k)$
Timed est. $\hat{x}(k)$

(II) $x(k)$ time-varying

(...)

Extracting estimates from PDFs: (1), (2), (3)

$\rightarrow$ here: for const $x$ (I)

$\rightarrow$ can use concepts also for (II) at particular $k$