MA(g): Moving Average process of order g
- white noise passing thru an all-zero filter \( \Rightarrow g \) zeroes

\[
Y[n] \quad \rightarrow \quad X[n] = \sum_{k=0}^{g} b_k Y[n-k] \quad \rightarrow \quad X[n] \\
\]

\[
R_{yy}[m] = \sigma_w^2 \delta[m] \\
= E\{Y[n] Y^*[n-m]\}
\]
Side note:

\[ x[n] \rightarrow h[n] \rightarrow y[n] \]

WSS \hspace{1cm} Deterministic \hspace{1cm} WSS
r.p. \hspace{3cm} LTI \hspace{3cm} r.p.

\[ S'_{yy}(\omega) = |H(\omega)|^2 \cdot S'_{xx}(\omega) \]

- Inverse Fourier Transforming:

\[ r_{yy}[m] = r_{hh}[m] \ast r_{xx}[m] \]

\[ \iff \]

\[ E\{y(n)y^*(n-m)\} \iff h[m] \ast h^*(-m) \iff E\{x(n)x^*(n-m)\} \]
Second side-note: all-zero (FIR) filter

\[ y[n] = \sum_{k=0}^{M} b_k \times [n-k] \]

\[ h[n] = \sum_{k=0}^{M} b_k \delta [n-k] \]

\[ = \{ b_0, b_1, ..., b_M \} \quad \{ \text{"length"} \} = M+1 \]

\[ r_{hh}[m] = h[m] \ast h[-m] \quad \{ \text{"length"} \} = 2(M+1)-1 \]

\[ \neq 0 \text{ for } |m| \leq M \]

\[ = 0 \text{ for } |m| > M \]
THUS: for MA(q) process:

\[
\text{(recall: output is } x[n] \text{)} \\
\Rightarrow \text{input is } y[n]
\]

\[r_{xx}[m] = 0 \text{ for } |m| > q\]