# Extension of Bayesian MDL for Changepoint Detection

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## 1 Current Bayesian MDL Formula

### 1.1 Linear model

Given a changepoint model $\boldsymbol{\eta}$, the sampling distribution (**??**) has the regression representation

$$\mathbf{X}_{1:N} = \mathbf{A}_{1:N}\mathbf{s} + \mathbf{D}_{1:N}\boldsymbol{\mu} + \boldsymbol{\epsilon}_{1:N}, \tag{1}$$

with $\mathbf{A}_{1:N} \in \mathbb{R}^{N\times T}$ and $\mathbf{D}_{1:N} \in \mathbb{R}^{N\times m}$ as seasonal and regime indicator matrices, respectively:

$$[\mathbf{A}_{1:N}]_{t,v} = \mathbf{1}(\text{time } t \text{ is in season } v), \quad v = 1, \ldots, T,$$
$$[\mathbf{D}_{1:N}]_{t,r-1} = \mathbf{1}(\text{time } t \text{ is in regime } r), \quad r = 2, \ldots, m+1,$$

where $\mathbf{1}(A)$ denotes the indicator of the event $A$.

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