Quota lease price function

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- Filename: qlease.m

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- Purpose: Function that returns the expected lease price for a given set of state variables.

Description

The function `qlease` returns the expected end-of-season quota lease price given a common set of exogenous state variables.

In any period t, fishers are assumed to form a common forecast of the end-of-season quota prices, and based on that forecast, the fishery that is optimal is chosen. We assume that forecasts are based on fleet-wide information that is observed at the beginning of the period prior to making a fishery decision. In this sense, fishers observe the aggregate state of the world and update their expectations over future quota prices.

Suppose the information vector $\mathbf{I}_t$ is composed of d variables, so that we want to approximate $\mathbf{w}\left(\mathbf{I}_t; \eta\right)$ over a d-dimensional interval:

$$\mathbf{I} = \left\{ (I_1, ..., I_d) \,|\, a_i \geq I_i \geq b_i, i = 1, ..., d \right\}.$$

Let $\phi_{s,i}(I_i) = [\phi_{s,i,1}(I_i), ..., \phi_{s,i,n_i}(I_i)]$ for $i = 1, ..., d$ and $s = 1, ..., S$ be an n_i-degree row vector of univariate basis functions defined on $[a_i, b_i]$ for approximating w_s. Then an approximant for w_s can be written as:

$$\hat{w}_s(I_1, ..., I_d) = [\phi_{s,1}(I_1) \otimes \cdots \otimes \phi_{s,d}(I_d)]\,\eta_s, \quad \forall s = 1, ..., S,$$

where η_s is an $N \times 1$ column vector of collocation coefficients and $N = \prod_{i=1}^{d} n_i$.

To start, we assume that $I_t = [Z_t, t]$, where Z_t denotes fleet-wide cumulative catch up to period t;

```
function w = qlease(eta,I,m)
```

Input arguments:

- `eta` = a $N \times S$ matrix of collocation coefficients;

- $\texttt{I}$ = a $NS \times d$ matrix of collocation nodes;

- $\texttt{m}$ = a structural array containing parameter values

Output arguments:

- $\texttt{w}$ = a $N \times S$ matrix of expected quota lease price;

Notes:

- The vector η will be provided by a Matlab solver (e.g., $\texttt{fsolve}$).

- See the CompEcon toolbox documentation for details on the function $\texttt{funeval}$ (Miranda and Fackler, 2005).

Calculate price for each species

```
w = zeros(size(I,1),m.model.S);
for s = 1:m.model.S
    % Evaluate approximated quota price for species s at
 collocation nodes
    w(:,s) = funeval(eta(:,s),m.fspace,I);
end

end
```

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