# Reward and Transition functions

## Table of Contents



- Filename: func.m
- Authors: Matt Reimer
- Created: 07/08/17
- Purpose: Function for determining expected reward and catch for a fishery choice.

# Description

The function `func` returns the expected reward and catch for a single fishery choice.

**Reward**: The expected reward for vessel $i$ selecting fishery $j$ at time $t$ is:

$$\pi_{i,j,t} = (p - w)' (q_i \circ EC_{j,t}) - c_j + \varepsilon_{i,j,t}$$

where $p$ is a vector of exvessel prices, $w$ is a vector of expected lease prices for quota, $EC_{j,t}$ is a vector of expected catch, $q_i$ is vector of catchability coefficents, $c_j$ is the cost of fishing in fishery $j$, $\varepsilon_{i,j,t}$ is an idiosyncratic shock that is observed by the fisher but not by the researcher, and $\circ$ represents element-wise multiplication.

**Catch**: The catch received by fishery $i$ after choosing to fish in fishery $j$ in period $t$ is equal to:

$$C_{j,s,t} = q_i \circ exp\{e_{j,s,t}\}.$$

```
function [out1] = func(flag,x,t,i,k,w,m)
```

# Input Arguments:

- `flag` = signal for reward or transition function;
- `x` = the action variable (fishery);
- `t` = time period;
- `i` = vessel;

- `k` = iteration (for expectation);
- `w` = expected quota lease prices.
- `m` = a structure of parameter values;

# Internal Arguments

- `e` = random variable determining catch;
- `sig` = random variable representing "signalling error";
- `EC` = an array of expected catch used in reward function and constraints;

# Output Arguments:

For the reward (`flag`='f'), the function provides: `out1` = the value of the current period's reward.

For the transition (`flag`='g'), the function provides: `out1` = the value of the current period's catch.

# Notes:

Eventually, the reward function will be revised to include $x'_{i,j,t}\theta$, where $x_{i,j,t}$ is a vector of state variables and $\theta$ is a vector of structural parameters to be estimated.

# Function parameters

```
p = m.model.p;          % exvessel price vector
c = m.model.c;          % fishing cost
q = m.catch.data.q;     % Catchability coefficients
e = m.catch.data.e;     % Random shocks to catch
EC = m.catch.data.EC;   % Expected catch
```

# Reward Function

```
switch flag
    case 'f'

        out1 = ((q(:,i)').*EC(x,:,t))*(p - (w')) - c(x) +
m.signal(x,t,i);     % Reward
```

# Transition Function

```
    case 'g'
        C = squeeze(exp(e(:,:,t,i,k)));             % Actual
Catch: a function of the realized shock
        out1 = (q(:,i)').*C(x,:);
end

end
```

*Published with MATLAB® R2016b*