We can also express the surplus value of access to j as

(3) $$WTP_{ijt} = \frac{\ln(1-P_{ijt})}{-\rho_t}$$ $\rightarrow$ P_{ijt} Prob visit site j

$trips_{it}$ vs $trips_{ijt}$

We can write aggregate welfare, i.e. social welfare, for site j in year t as

(4) $$\sum_{i=1}^{N} \overline{trips_{it}} \times WTP_{ijt}$$

where $\overline{trips_{it}}$ is the total number of choice occasions for i in period t. Including the option to stay home, $\overline{trips_{it}} = \sum_{j=1}^{J+1} trips_{ijt}$, where $trips_{ijt}$ is the number of trips taken by i to any j at time t. Note that we can write that $\overline{trips_{it}} \times P_{ijt} = trips_{ijt}$.

verify.

STOCK

★ The price of stock @ site is deriv of (4) wrt S_t.

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(8) $$p_{jt} \equiv \frac{\beta_t}{\rho_t} \sum_{i=1}^{N} trips_{ijt}.$$

This equation says that price is the stock effect multiplied by the number of trips divided by the travel cost parameter. Expressed another way, price is marginal willingness to pay for the stock multiplied by the number of trips.

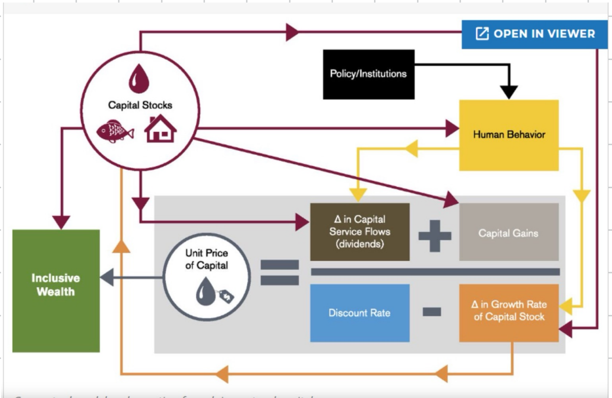
- P_{ijt}: Flow of ecosystem service benefits; the income produced by the stock $\rightarrow$ not asset value.

$\Rightarrow$ Nonmarket Income: $P_{jt} * S_{jt}$

$$\sum trips \cdot \left(\frac{1}{p_t(1-p)} \cdot \left[p\,\beta - p_i^2\,\beta \right] \right]$$

$$= \sum \frac{t\ p\beta}{p} = \frac{\beta}{p} \cdot \sum trips$$

$$\sum trips_{it} \cdot \frac{p\beta}{r} = \frac{\beta}{r} * trips_{ijt}$$



$$p(s) = \frac{D_s(s, x(s)) + \dot{p}(s)}{\delta - (G_s(s) - HI_s(s, x(s)))}.$$

9. Differentiate wrt s:

$$p(s) = \frac{MD(s, x(s)) + \dot{p}(s)}{\delta - [MG(s) - MHI(s, x(s))]},$$

10.

SHADOW PRICE

$$p^i(s) = \frac{W_{s^i}(s, x(s)) + \left(\frac{\partial p^i}{\partial s^i}\dot{s}^i + \sum_{j \neq i} \frac{\partial p^j}{\partial s^i}\dot{s}^j\right) + \sum_{j \neq i} p^j \frac{\partial \dot{s}^j}{\partial s^i}}{\delta - (G^i_{s^i}(s) - f^i_{s^i}(s, x(s)))}. \quad (9)$$

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NRNCP

Eq. (9) says the shadow price of a natural capital asset equals the marginal ome flow from a change in natural capital stock, $W_s(s, x(s))$, adjusted by an-

$$p(s) = \frac{MD(s, x(s)) + \dot{p}(s)}{\delta - [MG(s) - MHI(s, x(s))]}$$

$$p(s) = \frac{W_S(S,\ x(S)) + \dot{p}(S)}{\delta - [G_S(S) - F_S(S,\ x(S))]}$$

$$\delta V = W(s,\ \boldsymbol{x}(s)) + \boldsymbol{p}(s)'\dot{\boldsymbol{s}} = H(\boldsymbol{s}, \boldsymbol{x}, \boldsymbol{p}) = H^*(\boldsymbol{s}, \boldsymbol{p}) \quad (6)$$

$H(\boldsymbol{s}, \boldsymbol{x}, \boldsymbol{p})$ is the current value Hamiltonian (CVH), which comprises the flow of current benefits (dividends), $W(\boldsymbol{s}, \boldsymbol{x}(s))$, and the value of increments to the stock (capital gains), $\boldsymbol{p}'\dot{\boldsymbol{s}}$.[16] The substitution of the economic program allows the CVH

W= the marginal static net benefit from an increase in the stock, is the effect of the change in the stock on economic surplus measures (e.g., net revenues in a commercial fishery with a competitive output market).