Energy Efficiency Financing

A REVIEW OF RISKS AND UNCERTAINTIES

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Economic & Financial

Mostly extrinsic, uncontrollable risks that are common to other non-EE investments. They are often managed by means of contracting or some other hedging mechanism. This type of risk can manifest as either unexpected interest rate increases, volatile fuel/energy prices, uncertainty in demand charges, and loan payment default risks.

Interest rates, fuel prices, default rates

Measurement & Verification

Accurate measurement of the realized savings is required to insure the viability of the investments. M&V is essential for achieving long-term energy savings. International Performance Measurement and Verification Protocol is a guidelines for mitigating these risks.

Modelling errors, poor data quality, inconsistent measurement

Contextual & Technology

These risks involve unpredictable externalities or uncertainties related to the technical specifications of the project. Difficult to generalize these in financial modelling.

Poor project design, poor performance

Behavioral & Operational

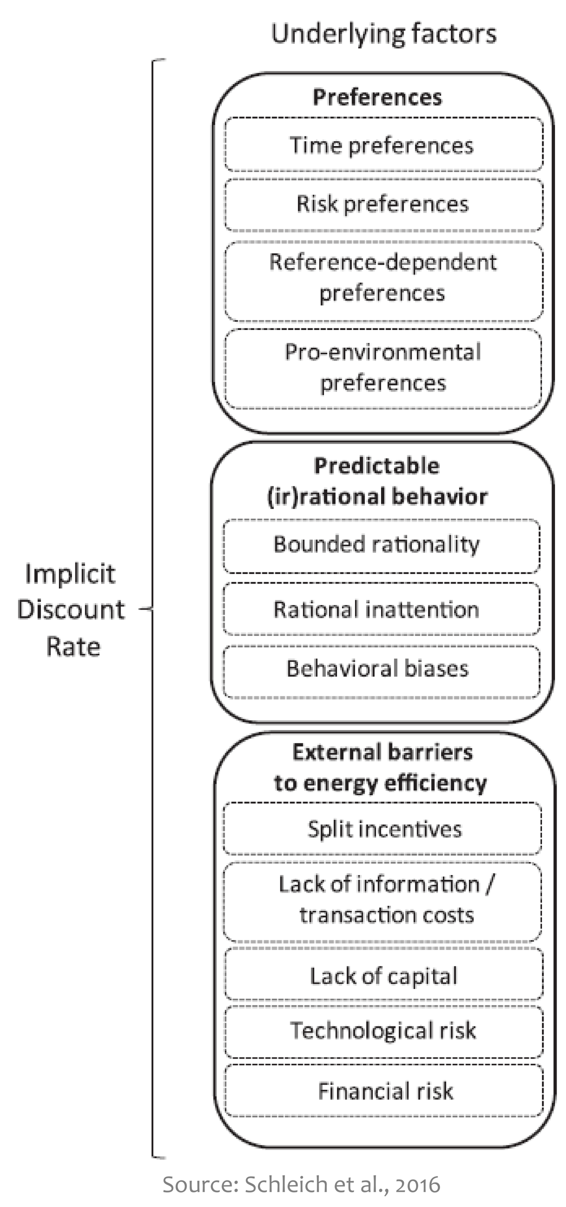
Manifest as unexpected consumption patterns, faulty operation or improper maintenance of equipment, behavioral biases, and rebound effects. They are often caused behavioral patterns related specifically to energy use.

Rebound effect, faulty operation, consumption patterns

Modified present value method

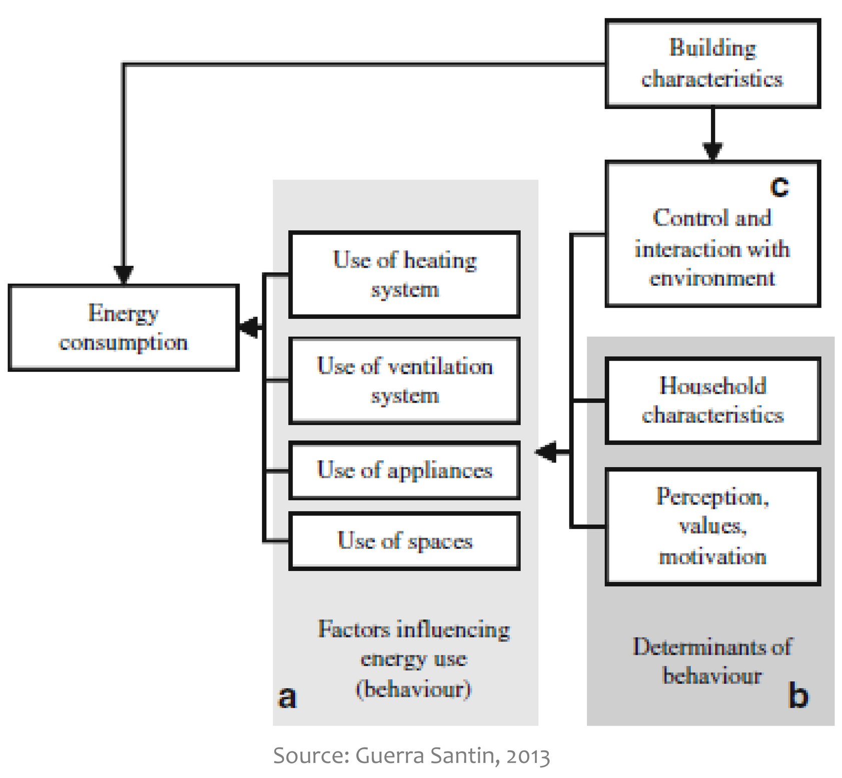
$$PV' = \sum_{t=1}^{N} \frac{P_t F_C}{(1+r)^t} - \sum_{t=1}^{N} \frac{P_t F_N}{(1+r)^t}$$

Source: Thompson, 1997



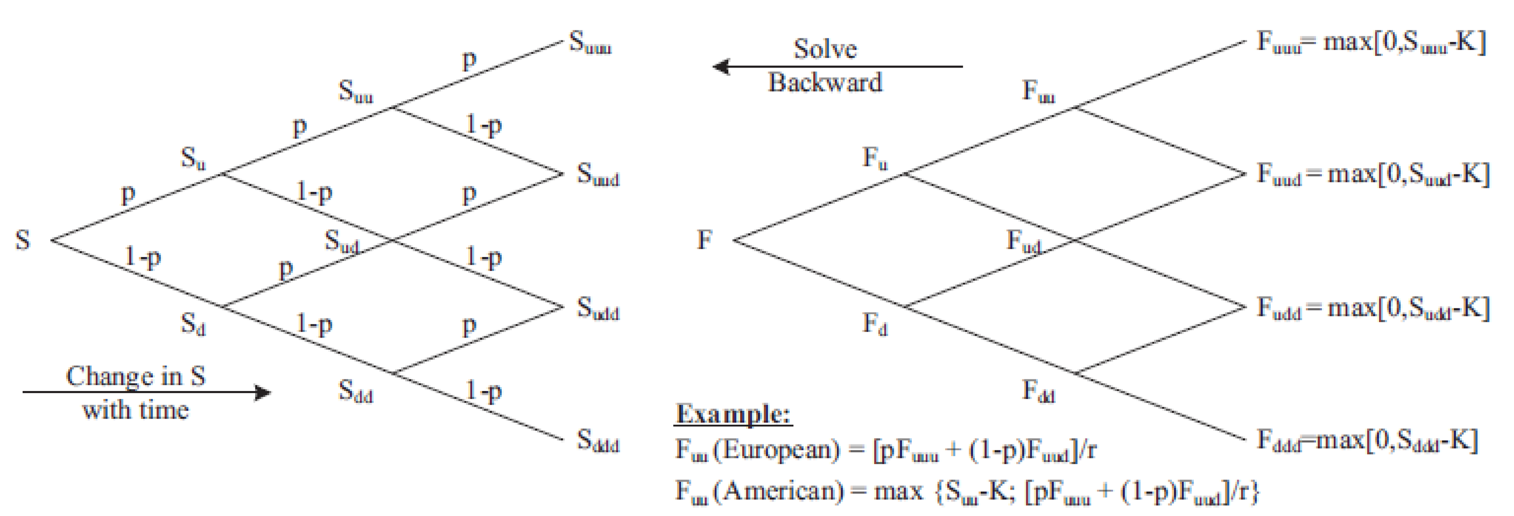
Source: Schleich et al., 2016

Determinants of energy use model



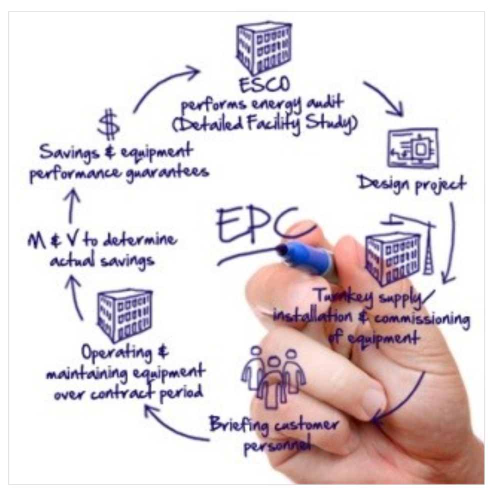
Source: Guerra Santin, 2013

Using option pricing theory to augment NPV



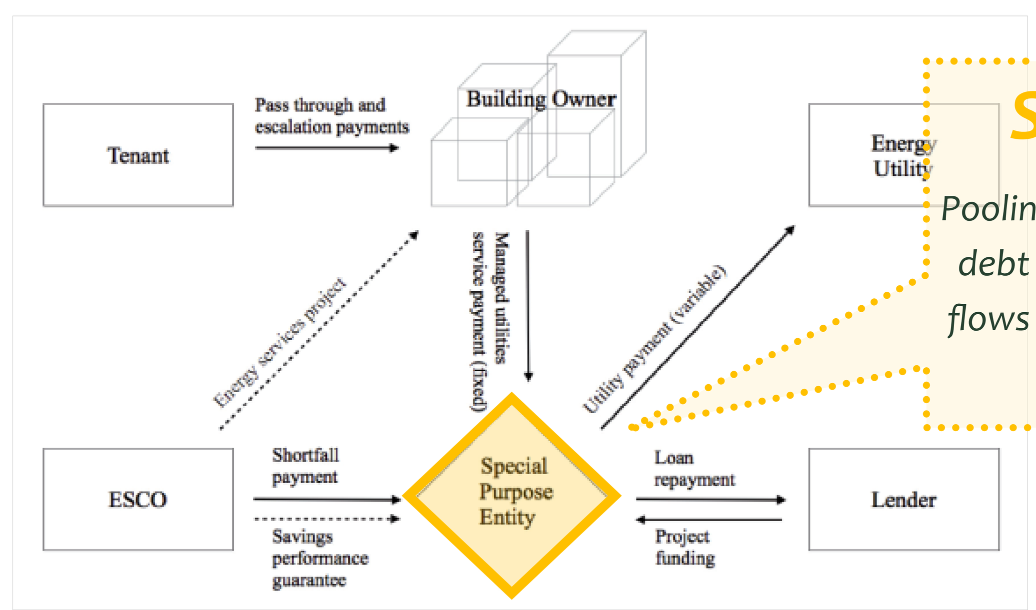
Source: Menassa, 2011

Energy Service Company (ESCO) + Energy Performance Contract (EPC)



- Risk transfer
- Guaranteed savings
- Returns are tied to performance
- Popular in public and industry
- Difficult to replicate in residential
- Capital expenditure remains on balance sheet of ESCO

Managed utilities service agreement



Securitization

Pooling various types of contractual debt and selling their related cash flows to third-party investors as securities.

Source: Bevington, 2013

Conclusions for future research

Role of institutional investors

Market potential for energy efficiency securities

Development of secondary market

More focus on third-party investor as decision maker

Selected references

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