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# Investment decisions with loss aversion over relative consumption

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ABSTRACT

We study an exchange economy in which investors are loss averse over relative consumption, that is, they suffer a utility loss if they consume less than members of their reference group. As a consequence there is an incentive to hold the same portfolio of risky assets as the reference group. Thus, risk premia can be supported in equilibrium that diverge from the risk premia obtained without loss aversion over relative consumption. This effect may be used to explain time-varying risk premia that are empirically observed for many assets.



## 1. Introduction

In this paper we study the investment decisions of fully rational investors who exhibit loss aversion over relative consumption. We show in a simple exchange economy that such preferences lead to multiple equilibria, which differ with respect to equilibrium asset prices. This effect may be used to explain time-varying risk premia that are empirically observed for many assets.

We consider investors who are risk averse about consumption. In addition they suffer a utility loss if they consume less than members of their reference group. In the following we will use the term “utility from consumption” to refer to the utility an investor would derive from an allocation if he did not care about the consumption of his reference group. The additional utility reduction brought about by falling behind his peers will be termed “psychological loss”.

The main intuition for our result is as follows: Without the loss component there is a unique set of asset prices in our exchange economy so that all investors are exactly willing to hold on to their endowment. We will call these prices the benchmark prices in the following. If prices were to deviate from this benchmark, all investors would want to simultaneously buy or sell and the asset markets would not clear anymore.

With loss aversion over relative consumption, however, the investors might not want to adjust the portfolio they are holding. Suppose, all peers of an investor keep their endowment of a risky asset although asset prices diverge from the benchmark. Then the investor faces the following trade off: Either he replicates his peers' portfolio and faces reduced utility from consumption. Or he maximizes utility from consumption but risks a psychological loss because he consumes less than his reference group if his portfolio performs badly.

The latter effect will dominate if asset prices are not too far away from the benchmark. This holds because a small deviation from the portfolio that maximizes utility from consumption results only in a second order loss, while the psychological loss

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is of first order. The latter is an implication of the kink at the reference point and, for that matter, of loss aversion. This implies that equilibrium asset prices are no longer unique. Instead, we can support a range of asset prices around the benchmark level in equilibrium.

If the asset is risk free, trading in it only changes the intertemporal distribution of consumption but does not expose the investor to the risk that his lifetime consumption is lowered relative to the consumption of his reference group. Therefore, the pricing of a risk free asset is not affected by the introduction of loss aversion over relative consumption. Hence, deviations from the benchmark price are deviations of the risk premium from the benchmark risk premium.

When describing investor preferences we depart from the strict von Neumann–Morgenstern paradigm in two ways, both of which are well established in the literature. First, the investors in our model do not derive utility exclusively from the absolute amount of their own consumption but compare the amount they consume to the consumption of a reference group. This idea dates back at least to Veblen (1922) and has recently been applied to a number of research fields. In macroeconomics and consumption based asset pricing so-called "catching up with the Joneses" specifications of the utility function (Abel, 1990; Campbell and Cochrane, 1999) have been used. In microeconomics utility functions that include equity concerns have proved useful to organize the data obtained from many experiments (Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000).

The second component is loss aversion, that is, investors suffer a psychological loss the more their consumption drops below a reference level and this loss is concave in the distance from the reference point. Loss aversion has been introduced by Kahnemann and Tversky (1979) as a building block of their prospect theory to explain a broad array of so-called anomalies that had been found in experimental studies. Recently, it has been applied to financial markets by Benartzi and Thaler (1995) and Barberis et al. (2001), who introduce investors that suffer a loss, whenever the value of their portfolio falls below the value it had in the previous period. In contrast to Benartzi and Thaler (1995) and Barberis et al. (2001), investors in our model suffer a loss if members of their reference group consume more than they do. This implies that if everybody gets rich in a bull market an investor who gets only a small positive return suffers a utility loss.

Economists have studied the implications of relative consumption concerns for asset prices at least since Abel (1990), who introduced consumers who compare their own consumption to past aggregate consumption. More closely related to our approach are Gali (1994) and Gomez (2007) who, like us, consider investors who evaluate their consumption relative to the contemporaneous consumption of their peers. They find, at least for certain specifications, that relative income concerns can contribute to the explanation of asset pricing anomalies such as the equity premium puzzle. These models, however, have unique equilibria and cannot serve as a tool to study coordination problems in financial markets. Multiple equilibria do not arise because relative consumption concerns in this literature do not take the form of loss aversion. It is the combination of loss aversion and relative income concerns that gives rise to the multiplicity of equilibria.

Most closely related our approach is DeMarzo et al. (2007). Like us, they obtain multiple equilibria, some of which involve time-varying returns. They use a model in which relative income concerns arise endogenously because investors anticipate that they will want to buy a scarce asset in the future; this asset becomes more expensive for an investor whenever the other investors in his cohort have earned high returns. An investor can insure against the price changes in the scarce asset if he replicates the portfolio his cohort is buying. A core assumption is that the asset cannot be traded ex-ante, that is, markets are incomplete. With our preference formulation, multiple equilibria can arise even if markets are complete.

In Section 2 we lay out the basic model, Section 3 characterizes the equilibria and Section 5 concludes.

## 2. The model

The model we use is a three period ($t \in \{1, 2, 3\}$) version of the Lucas (1978) exchange economy. The investors consume a perishable consumption good, which is exclusively produced as a dividend by a three-period-lived asset, called the tree asset. It is in fixed supply of one and in period 1 all investors are endowed with an equal amount. In every period $t$, the investors first derive a dividend of $d_t$ units of the consumption good from each unit of the asset they hold; the random dividend payment is i.i.d. distributed with the pdf $f(d)$. Then the investors must decide how much to trade in the asset at the ex dividend price of $p_t$, before they consume their end of period holdings of the consumption good.

In contrast to Lucas (1978) we do not employ a representative investor but a continuum of identical investors of size one, who compare themselves to all other investors.[1] Each investor $i$ evaluates his own consumption stream $(c_{i1}, c_{i2}, c_{i3})$ relative to the consumption of his peers $(c_{j1}, c_{j2}, c_{i3})$ according to

$$EU_i = E\left[U^C(c_{i1}, c_{i2}, c_{i3}) + U^L(c_{i1}, c_{i2}, c_{i3}, c_{j1}, c_{j2}, c_{j3})\right].$$

Let $\beta$ be a discount factor, then utility from consumption ($U^C$) is given by

$$U^C(c_{i1}, c_{i2}, c_{i3}) = \sum_{t=1}^{3} \beta^{t-1} u(c_{it}).$$

[1] Because all agents will hold the same portfolio in equilibrium, any equilibrium can also be supported with any other reference group specification.