A Theory of Subjective Feeling with Applications to Time Allocation

Jay S. Coggins (jcoggins@umn.edu) and Orges Ormanidhi (orman019@umn.edu)

Department of Applied Economics
University of Minnesota

The Primitive: Subjective Feeling

Preferences form the foundation of neoclassical economic theory and its applications. They are considered an individual characteristic, the primitive that guides human behavior. In revising this consideration, we raise the following question: what if we start with a primitive that is more basic and profound than preferences? Then a new theory would have to be created, one that does not rely upon preferences as the motivation for human behavior. We have created a new theory with an alternative primitive that guides human behavior.

This primitive is *subjective feeling*, the foundation of our theory, and our chosen individual characteristic. By subjective feeling, we mean the instantaneous experiences of a subject's brain and body from both *the engaged activity* and *non-engaged activities* on which he is considering spending a non-negative amount of *time*. We distinguish between the *subject*, whose behavior is being studied, and the *observer*, who is studying the behavior of someone else; hence the adjective "subjective" in our primitive.

The Ingredients: Subjective Feeling, Activities, and Time

We represent a subject's instantaneous experiences from both the engaged activity and non-engaged activities with functions of time. Subjective feeling, activities and time are the basic ingredients of our theory, taken as given. As the primitive, subjective feeling is an individual characteristic. Activities and the period of time depend on the observer studying a subject's behavior. For example, the set of activities when studying a subject's behavior during the next few minutes might be different from the set of activities when studying the same subject's behavior during the next few decades. In our theory, the observer determines the period of time during which a subject is considering allocating a non-negative amount of time to a set of activities.

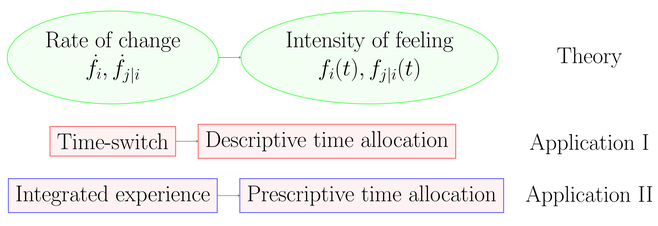
Activities: Engaged and Non-Engaged

We call the activity on which a subject is spending time the engaged activity and the remaining activities non-engaged activities. An immediate result of our theory is to derive the instant of time when a subject decides to switch from engaging in an activity to engaging in another activity. With this result, as observers, we are able to explain the amount time a subject spends on each engaged activity and the order of engaged activities during a given period starting at the instant of time $t = 0$ (or some other non-zero time) and ending at $t = T$. Once a subject's choices of the amount of time spent on each engaged activity and the order of engaged activities during period $[0, T]$ are explained, observers have opportunities to further explain human experiences by analyzing the subject's economic, health, social, or other choices associated with these activities, analysis that is deferred to future work.

By activity, we mean anything on which a subject is considering spending time, with time measured with real numbers. For example, if a subject considers walking and chewing gum as two separate activities happening in two different time intervals, then walking and chewing gum are two different activities; if a subject considers walking and chewing gum as a joint activity happening at the same time, then walking and chewing gum are a single activity.

Suppose that walking and chewing gum are two different activities on which a subject is considering spending time. If he is walking and considering spending time on chewing gum, then walking is the engaged activity and chewing gum is a non-engaged activity. Although the subject is currently walking and only thinking about chewing gum, his subjective feeling includes the simultaneous experiences from both walking and (mentally) chewing gum.

Roadmap: A Theory and Two Applications



A Theory: Two Models

Our theory has three assumptions. In Assumption I, we assume that a subject is considering spending time, denoted by t, on a finite set of n activities. In Assumption II, at any moment in time, we assume that the subject is engaged in a single activity i, $i = 1, 2, 3, ..., n$. We call our measure of subjective feeling at every moment in time *the intensity of feeling*, denoted by $f_i(t)$ for the engaged activity i and, given i, denoted by $f_{j|i}(t)$ for non-engaged activities j, $j \neq i$: **The intensity of feeling** from each activity is a differentiable function of time which represents a subject's instantaneous experience from the activity. In Assumption III, we assume that the rate of change in the intensity of feeling from an activity equals the difference between the proportional change in the intensity of feeling function for that activity and the sum of proportional changes in the intensity of feeling functions for the other activities, up to a coefficient of proportionality, also a function of time, denoted by $\beta_i(t)$ for the engaged activity and, given i, $\beta_{j|i}(t)$ for non-engaged activities. Assumptions I, II and III ensure the existence of intensity of feeling functions for both the engaged activity and non-engaged activities acting simultaneously on a subject at any moment in time.

Model 1: Intensity of feeling function for each engaged activity $\dot{f}_i = \beta_i(t) f_i(t) - \sum \beta_k(t) f_k(t), \quad i = 1, 2, 3, \cdots n$

Model 2: Intensity of feeling functions for non-engaged activities given the engaged activity $\dot{f}_{j|i} = \beta_{j|i}(t) f_{j|i}(t) - \left(\sum \beta_{l|i}(t) f_{l|i}(t) + \beta_i(t) f_i(t)\right), \quad j = 1, 2, \cdots, i-1, i+1, \cdots, n$

Application I: Descriptive Framework

The descriptive framework includes the concepts of *the switch-time* and *a schedule*: **The switch-time** is the unique instant when the engaged activity becomes a non-engaged activity and one of non-engaged activities becomes the engaged activity. We prove that the switch-time can only happen at a single instant of time; Given a finite number of switch-times, **a schedule** is the order of engaged activities; Each schedule gives an overall experience from both the engaged activities and non-engaged activities.

With Assumptions I, II and III, we explain a subject's choice of time allocations to different activities for any schedule (order of engaged activities). A chosen schedule might or might not give the optimal/maximum overall experience because it does not depend on any assumptions on optimization.

Application II: Prescriptive Framework

The prescriptive framework includes the concepts of *integrated experience* and *conditional rationality*: **Integrated experience** represents the accumulation of instantaneous experiences from both the engaged activity i and, given i, non-engaged activities $j|i$; Given a finite number of switch-times, **conditional rationality** is the cognitive ability of a subject to order a finite number of schedules (overall experiences).

In the additional Assumption IV, we assume that a subject who satisfies conditional rationality also maximizes overall experience. With Assumptions I, II, III and IV, we explain a subject's choice of time allocations to activities and the optimal schedule (order of engaged activities). The chosen schedule gives maximum overall experience and is optimal because it depends on an assumption on optimization.

Concluding Remarks

Our theory expands modern economic theory by making it *more general* and *more generous*.

More general: our theory explains a non-optimal choice of time allocation and schedule.

More generous: our theory has weaker assumptions, in particular a weaker version of rationality, than economic theory, and predicts both the optimal time allocation and schedule.

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