



**HAL**  
open science

## Decision and Time from a Humean Point of View

Marc-Arthur Diaye, André Lapidus

► **To cite this version:**

Marc-Arthur Diaye, André Lapidus. Decision and Time from a Humean Point of View. 2016. hal-01372527v3

**HAL Id: hal-01372527**

**<https://paris1.hal.science/hal-01372527v3>**

Preprint submitted on 29 Jan 2019 (v3), last revised 27 Sep 2020 (v4)

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

# Decision and Time from a Humean Point of View

Marc-Arthur Diaye\*, André Lapidus\*\*

This version: December 2018

## Abstract

Until recently, little attention has been paid to the consequences of Hume's theory of action for intertemporal decision. Yet in view of the recurring discussion concerning situations of conflicting choice between a close and a remote objective, which run from Book 2 of the *Treatise*, to the second *Enquiry*, to the *Dissertation*, intertemporal decision appears, at least in part, to be an outcome of the role of the natural relation of contiguity in the formation of the structure of desires, and thus different from the structure of pleasure. This paper shows, and expresses formally, that Hume's approach provides alternative conditions which explain time-consistency on the one hand, and dynamic time-inconsistency on the other, when the link between contiguity and the 'violence' of the passions is taken into account. The possibility of time-inconsistency is acknowledged by Hume as giving rise to general aversion, therefore constitutes a key argument in explaining the origin of government.

*Keywords:* Hume, intertemporal decision, pleasure, belief, passion, desire, government.

*JEL classification:* B11, B31, D10.

## 1 Introduction

Until recently, little attention has been paid to the intertemporal aspect of David Hume's theory of action, although some of its characteristics have been discussed by Davis (2003), Lapidus (2000, pp. 42-49, 2010), and Palacios-Huerta (2003). For instance, Davis (2003) and Lapidus (2000, 2010) have noted the link between the violence of the passions and decision in time, whereas Lapidus (2000, 2010) and Palacios-Huerta (2003) have provided an updated account of the possibility of what, since the pioneering work of Robert Strotz (1956), has been known as time-inconsistent decisions. Moreover, Palacios-Huerta has shown that the history of intertemporal decision does not begin with the notion of discounted utility, and interpreted Hume through a hyperbolic discounting model. The reason for the paucity of interest on this topic seems to stem from the rather complex way in which Hume constructs his account of intertemporal decision.

From a textual viewpoint, the origins of Hume's conception of decision lie in some of his main philosophical works, the *Treatise on Human Nature* (Hume 1739-40), the two *Enquiries* (Hume 1748, 1751) and the *Dissertation on the Passions* (Hume 1757); in general terms it appears as an

---

\*CES (Centre d'Economie de la Sorbonne), University Paris 1 Panthéon-Sorbonne – 106-112, boulevard de l'Hôpital – 75647 Paris Cedex 13 – France. E-mail: marc-arthur.diaye@univ-paris1.fr.

\*\*PHARE, University Paris 1 Panthéon-Sorbonne – 106-112, boulevard de l'Hôpital – 75647 Paris Cedex 13 – France. E-mail: andre.lapidus@univ-paris1.fr

outcome of his theory of passions. Analytically, Hume’s treatment of decision might be viewed as the implementation of a common pleasure-belief-desire process in fields nowadays recognized as distinct (indiscrimination problems, decision in time or in space, decision under risk or uncertainty). At first sight, this looks like a Benthamite approach *ante litteram*, in which pleasure and pain play a leading part. However, it is not. The reason is quite specific to Hume and rests on his theory of knowledge. On the one hand, there is no doubt that pleasure and pain play a determining role in Hume’s account of the birth of action; just as they would half a century later for the author of the *Introduction to the Principles of Morals and Legislation* :

Nature has implanted in the human mind a perception of good and evil, or in other words, of pain and pleasure, as the chief spring and moving principle of all its actions (Hume 1739-40, 1.3.10.2).<sup>1</sup>

But on the other hand, as shown by the lines which follow this extract, this role is not straightforward, since pleasure manifests in two separate realms, the one of impressions and the other of ideas, where the latter is unable to give rise to action by itself:

[P]ain and pleasure have two ways of making their appearance in the mind; of which the one has effects very different from the other. They may either appear in impression to the actual feeling, or only in idea, as at present when I mention them (Hume 1739-40, 1.3.10.2).

As is well known by Hume scholars, belief is introduced as the device which transfers some of the force and vivacity of pleasure considered as an impression over to pleasure considered as an idea, and thus makes action possible (Hume 1739-40, 1.3.8.2). Desire is the resulting impression (or an impression of reflection, as Hume puts it; that is, a “passion”, “affection” or “emotion”) which expresses this belief and, through the operation of the will, results in action.

Hume’s account thus constitutes a two-stage pattern, where pleasure and desire stand respectively for the first and the second stage. Though quite general, this pattern generates some important consequences from the point of view of decision.

1. When interpreting desire and will as, respectively, preference and choice, we have shown (Diaye and Lapidus 2005a) that provided rather general conditions are fulfilled, the decision process leads to rationality in a double sense: *rationality of choice*, since general preferences are such that what is chosen on each element of the domain of choice is always what is preferred; and *rationality of preferences*, in that general preferences are both complete and transitive (preference is a preorder). Analytical differences from the standard approach to preferences and choice are emphasized in Lapidus (2018).
2. The disconnect between the decision-making aspects of choice and their content in terms of pleasure (the opposition which Richard Sturtevant (2004) emphasized between “motivation” and “valuation”, which prevents us interpreting Hume’s work from a simple hedonist viewpoint) means that we do not necessarily choose what gives us the greatest pleasure. Hume’s approach is built so that, rigorously speaking, it does not entail any particular consequences in terms of rationality. However, it brings to the fore the question of the attainability, at least in

---

<sup>1</sup>References to Hume’s works are given according to the divisions of the editions used in this paper: for the *Treatise* (Hume 1739-40), book, part, section and paragraph numbers; for the two *Enquiries* (Hume 1748 and Hume 1751) and the *Dissertation* (Hume 1757), section and paragraph numbers; and for the *Essays* (Hume 1777), Title of the essay [date of its first publication].

principle, of a position characterized by a maximum of pleasure. One of us (Lapidus 2011) has emphasized that it leads to specific welfare policies aimed at promoting what Hume called the “calm passions”, whose central place is also underlined hereafter.

3. The link which belief establishes between pleasure, as an impression of sensation, and desire, as an impression of reflection, responds to the working of the natural relations of our understanding (“causality”, “contiguity”, and “resemblance”) (Hume 1739-40, 1.1.4; 1748, 3.1-3), each giving rise to topics that we are used to considering separately (Diaye and Lapidus 2012, pp. 372-7): (i) though always present, the natural relation of causality, when considered independently, concerns decision under risk or uncertainty; (ii) the natural relation of resemblance concerns indiscrimination problems; (iii) contiguity is linked to decision in space or in time.

In a previous paper (Diaye and Lapidus 2012), we have illustrated the general role of belief in mediating between pleasure and desire by reference to the case of the natural relation between resemblance and indiscrimination problems, showing that a possible intransitivity concerning pleasure can be canceled by belief when giving rise to desire. Similarly, this paper focuses on intertemporal decision, and therefore on the natural relation of contiguity.<sup>2</sup>

Whereas on the one hand intertemporal decision can be viewed as a part of Hume’s theory of action, on the other hand it also relies on his theory of the idea of time, which he developed along with his theory of the idea of space (Hume 1739-40, 1.2). It is well known among Hume scholars that his conception of time raises several difficulties, so much so that it has often been seen as a disputable part of his work (see, among many others, Kemp Smith 1941, pp. 273-79, Flew 1976, Johnson 1989). The first difficulty arises from the particularity of the idea of time, which is not regarded as a copy from an alleged original impression of time, but as a copy from the impression of succession by which we identify changing objects (Hume 1739-40, 1.2.3.7-10). The second difficulty comes from the property of time as a magnitude which is not infinitely divisible, and yet nonetheless made up of durationless indivisible moments (Hume 1739-40, 1.2.2.2-4).<sup>3</sup>

Hume’s conception of time is also challenging for a contemporary reader, since besides its place within the project of the *Treatise*, the two difficulties pointed out above respectively concern the way we regard time as a *physical* and a *mathematical* magnitude. As a physical magnitude, understanding time not as an external dimension within which special arrangements of objects take place -- that is, as a container -- but as an effect of this arrangement itself -- that is, a relationist conception of time -- is at odds with most usual representations of the physical world. Some contributions, like those of Falkenstein (1997), Frasca-Spada (1998), Baxter (2001) or Coventry (2010), have minimized the uneasiness which accompanies such a conception, stressing the part played by the “manners of disposition” in the genesis of Hume’s idea of time, or else advocating some kind of finitism. But definitively suppressing this uneasiness requires a change in our physical reference points, of which the special theory of relativity is the primary example, being in accord with a relationist conception of time like Hume’s. While his idea of time didn’t really fit the representations of the physical world which were contemporary to him, its consistency with Einstein’s later conception is today all the more acknowledged given that Hume is now known to

---

<sup>2</sup>Hume relates the natural relation of contiguity to decision in time but also in space (Hume 1739-40, 2.3.7-8; 1751, 6.15; 1757, 5). Here we deliberately set aside what Hume has said about spatial decision, in order to focus on intertemporal decisions.

<sup>3</sup>Hume’s critique of infinite divisibility has often been viewed as having aged badly, especially in the light of subsequent work on infinity, notably Cantor’s (see Broad 1961, Flew 1976). In contrast, Baxter (1988) gives a more nuanced evaluation of Hume’s position, while Jacqueline (2001) argues in favour of Hume’s finitist representation.

have been one of Einstein’s major influences (see Stachel 2002, Norton 2010, and Slavov 2016). From a mathematical point of view, what Hume claims about time is no less puzzling. On the one hand, he argues against the infinite divisibility of time; on the other, he holds that the smallest interval of time, what he calls a “moment”, is durationless. An immediate consequence is that time would be better represented as discrete, rather than by using the real number line.

The interpretation of intertemporal decision proposed in what follows might be viewed as disregarding the possible idea of time which underlies it. From a physical viewpoint, remaining as close as possible to Hume’s teaching entails adopting a relationist conception of time which has no special consequences at the macro-level. As regards the mathematical representation, a discrete time would indeed be appropriate; but although such a position wouldn’t change our argument, for convenience in this paper we adopt a continuous time approach.

Section 2 proposes a reconstruction of the Humean foundations of decision in time,<sup>4</sup> mainly based on book 2, part 3, sections 7 and 8 of the *Treatise of Human Nature* and on the corresponding passages of the *Dissertation on the Passions*. It first gives the formal characteristics of a function of pleasure as an impression, and then accounts for the working of contiguity and belief in order to build an intertemporal desire function, where the desire for an object is all the more closer to the original impression since it is contiguous in time. At this stage, Hume’s approach shares the minimal requirement of the various approaches to intertemporal decision, namely something like a condition of impatience which explains the smaller decision weight attached to remote objects. Yet it also has its own specific characteristics, notably concerning the role granted to the emotional state as embodied in the degree of violence of the passions, which influences both the pleasure given by an object, the belief in this pleasure, and the discount of future objects. The latter varies according to the degree of violence of the passions, with the calm passion corresponding to a non-impatience configuration, such that no discount occurs.

Section 3 discusses the determinants of intertemporal discounting and shows that Hume’s approach can be viewed as a two-step procedure, bringing together what Hume called “distance” and “difficulty”. The first step deals with a conception of time “abstractedly considered”, in Hume’s words (Hume 1739-40, 2.3.7.9), in which equal magnitudes of time-distance have a similar influence. It is easy to discern in such statements a stationarity-like condition. Unsurprisingly, we then show that this allows us to be more specific about the intertemporal desire function, which is of an exponential discounting type, provided the degree of violence of the passion is given. It is also obvious that if such was the case, decisions would be time-consistent. This corresponds to a situation in which the possibility of a relation between “distance” and “difficulty” is ignored. The second step of the procedure is then based on Hume’s claim that, because of the part played by the natural relation of contiguity, time cannot be “abstractedly considered”. When an object becomes closer, Hume argues, the violence of the passion increases, making it more difficult for our mind to pass between a close and a remote object. In such a case, since the difficulty is now explicitly linked to distance, the dependence of the violence of the passions on the contiguity of an object forbids stationarity through the flow of time (allowing for changes in the violence of the passions) and, therefore, forbids exponential discounting at a constant rate. The resulting construction hence results in a combination between *static* time-consistency at each moment of time and *dynamic* time-inconsistency between these successive moments. When considering two distant

---

<sup>4</sup>Our formal treatment of Hume’s position on decision in time continues a research program which started with Diaye and Lapidus 2005a. It might also be viewed as the extension to the case of decision-making of a methodology used to account for social interactions through a game-theoretic approach by, for instance, Binmore (1994, pp. 27-34) or Hardin (2007, ch. 3-4).

objects, their relative discounting decreases over time, as it does for Palacios-Huerta (2003) who favoured a hyperbolic or quasi-hyperbolic representation of Humean discounting. And when these objects become more and more remote, the passion becomes sufficiently calm that they are less and less discounted not only relative to each other, but also relative to any other object: under a calm passion, the time-distance has a negligible effect.

As we conclude in section 4, these views come back to the fore in book 3, part 2, section 7 of the *Treatise*, where Hume discusses the acceptability of rules of justice. Justice is described as matching the remote interests of the individual, so that its desirability is directly challenged by impatience. On the other hand, since constant exponential discounting is given up, there is now room for dynamic time-inconsistencies to be taken explicitly into account. As a result, it is shown that for Hume the general aversion to time-inconsistency explains the support granted to a government whose main interest, as far as the observance of the rules of justice is concerned, is not to avoid dynamic time-inconsistency directly, but rather to avoid impatient behavior – which also results in the cancellation of time-inconsistencies.

## 2 Pleasure, belief and intertemporal desire: Humean foundations of decision in time

The degree of what Hume called the “violence of the passions” has a dual scope. On one hand, it governs the intensity of pleasure as an impression of sensation. As such, it does not involve any intertemporal considerations. But on the other hand, it also accentuates the decisional effects of the relation of contiguity, decreasing our belief in future pleasures relative to present ones, thus giving a basis to the intertemporal dimension of decision-making.

### 2.1 Pleasure and the violence of the passions

As we have recalled in a previous paper (Diaye and Lapidus 2012, pp. 358-364), there is evidence that Hume had at least some rough intuition of pleasure as a scalar magnitude. Such is the case, for instance, when he argued that

[a] good composition of music and a bottle of good wine equally produce pleasure; and what is more, their goodness is determin'd merely by the pleasure. (Hume 1739-40, 3.1.2)

It might, of course, be debated whether the scalar-magnitude interpretation is correct: for instance, an important tradition, drawing on Kemp Smith (1941, p. 164), considered pleasure and pain (among others) only as efficient causes of action, so that whether they are measurable magnitudes was not particularly relevant. However, some qualifications notwithstanding, we will hereafter accept the view of pleasure as a scalar magnitude.<sup>5</sup> And, since Hume distinguishes pleasure strictly speaking from pain, we consider this magnitude  $p$  to be non-negative ( $p \geq 0$ ) when it concerns pleasure, and negative ( $p < 0$ ) in the case of pain.

---

<sup>5</sup>The possibility of considering pleasure as a scalar magnitude is challenged by the existence of what is nowadays called “indiscrimination problems”. Indiscrimination between  $x$  and  $y$  occurs when the difference between the utilities of  $x$  and  $y$  in their absolute value for an individual is below the agent's perception threshold (see, for example, the presentation in Aleskerov, Bouyssou and Monjardet 2007). The working of the natural relation of resemblance in Hume raises similar problems. We have argued (Diaye and Lapidus 2012, pp. 367-68) that Hume's treatment of pleasure as a scalar magnitude might have been metaphorical, and this led us to represent pleasure as determined not by a *function*, but by a *correspondence*.

An interesting feature of Hume’s approach is that it does not simply entail that our level of pleasure is determined solely by such and such an object, let us say  $x$  chosen from a set of choice  $X$  (assumed to be included in  $\mathbb{R}_+^n$ , where  $n$  stands for the number of elementary objects). It is obvious, from a Humean point of view, that the objects which presumably provide us with pleasure or pain do not exist for us by the sole virtue of our reason and independently of our perceptions (Hume 1739-40, 2.3.3.3). They exist for us emotionally, so that the pleasure that we draw from  $x$  also depends on the emotional state which governs our ability to feel pleasure. This quality of an emotional state on which the ability to feel pleasure depends is what Hume called the degree of “violence” (Hume 1739-40, 2.1.1.3) of the passions, which is denoted  $v$  hereafter, with  $v$  belonging to  $V$ , which can be any compact in  $\mathbb{R}_+$ . The real-valued function  $p$  which determines pleasure can be written as depending on two arguments, the object of pleasure  $x$ , and the degree of violence  $v$  of the emotional state which governs our ability to get pleasure from these objects:

$$p : X \times V \rightarrow \mathbb{R} \tag{1}$$

$$(x, v) \mapsto p = p(x, v)$$

Drawing on the *Treatise* (Hume 1739-40, 1.3.12.24; 2.3.4.1-2) and some of Hume’s *Essays* – notably *Refinement in the Arts* (Hume 1777, *Of Refinement in the Arts* [1752], pp. 269-70) and the *Sceptic* (Hume 1777, *The Sceptic* [1742], p. 167) – we have previously introduced and discussed the following properties of the pleasure function  $p$  (Diaye and Lapidus 2012, pp. 359 *sqq*):

*Monotonicity* : (2a)

$$\forall x, y \in X, \text{ if } x \geq y, \text{ then } p(x, v) \geq p(y, v)$$

*Maximum with respect to the violence of passions*: (2b)

$$\forall x \in X, \operatorname{argmax}_v p(x, v) = \hat{v}$$

where  $\hat{v} = \inf (v \in V)$

*Cardinality* : (2c)

$p$  is cardinal with invariant zero

*Concavity relatively to  $x$* : (2d)

$p$  is concave with respect to  $x$

The two first properties show that  $x$  and  $v$  do not influence pleasure in the same way. On the one hand, monotonicity (2a), which concerns the objects of pleasure, does not require particular explanation: if the magnitudes of the components of  $x$  and  $y$  are suitably defined, it means just that more provides a pleasure greater than less. This might be illustrated by what Hume says about the consequences of an increase in quantity:

’Tis evident, according to the principles above mention’d, that when an object produces any passion in us, which varies according to the different quantity of the object; I say, ’tis evident, that the passion, properly speaking, is not a simple emotion, but a compounded one, of a great number of weaker passions, deriv’d from a view of each part of the object; for otherwise ’twere impossible the passion shou’d increase by the encrease of these parts. Thus a man who desires a thousand pound has, in reality, a thousand or more desires, which, uniting together, seem to make only one passion;

tho' the composition evidently betrays itself upon every alteration of the object, by the preference he gives to the larger number, if superior only by an unite. (Hume 1739-40, 1.3.12.24)

On the other hand, is not so intuitive that there exists a maximum relative to  $v$  (2b) independently of  $x$ , and this borders on an important topic of Hume's moral philosophy. For Hume assigns a particular role to a specific level of the violence of the passions, which he called the "calm passion". From numerous points of view (individual happiness, achievement of justice in the society, public morality, development of the arts, sciences and industry) Hume considered the calm passion as the most desirable emotional state.<sup>6</sup> This helps us to understand the rather strong assumption concerning the calm passion involved in (2b): Hume posited that whatever the object of pleasure  $x$  might be, the degree of violence which allows us to draw the greatest pleasure from it is that of a calm passion, denoted  $\hat{v}$  (see Lapidus 2011, pp. 219-20). In some cases, Hume acknowledges that a passion could be less than calm — he calls such a passion "remiss" in his essay on the Sceptic (Hume 1777, The Sceptic [1742], p. 167). However, this possibility is hereafter neglected, so that  $\hat{v}$  in (2b) is the lower bound of  $V$ .

Cardinality (with invariant zero) (2c) and concavity (2d) should be dealt with simultaneously, since the latter would be meaningless without the former. Both properties can be inferred from a passage of the *Treatise* (Hume 1739-40, 1.3.12.24) in which Hume compares the differences of the impressions between two pairs of amounts of money, and concludes that this difference is not as large when the amount of money is high as when it is low (Diaye and Lapidus 2012, pp. 365-66).

## 2.2 Desire, contiguity and impatience

Hume carefully distinguishes "the two ways" through which pleasure makes its "appearance in the mind" — as an impression, and as an idea derived from this impression (Hume 1739-40, 1.3.10.2). Now, the well-known problem raised by Hume's theory of action is that whereas impressions can give birth to action, ideas by themselves cannot. The resolution of this difficulty lies in his conception of *belief* as a device which transfers to a simple idea a "*share*" of the "*force and vivacity*" of the original impression in order to cause action (Hume 1739-40, 1.3.8.2). Such a transfer is performed by what Hume calls the "natural relations" of the mind, *causality*, *resemblance* and *contiguity* (see Hume 1739-40, 1.1.4; 1748, 3.1-3). We have argued that each of these relations is related to specific topics in decision theory which are nowadays taken to be distinct: *decision under risk or uncertainty* for causality, *indiscrimination* for resemblance (see above, note 5), and *decision in time or space* for contiguity (Diaye and Lapidus 2012, pp. 376-78).

The most detailed exposition of the latter can be found in book 2, part 3 of the *Treatise*, mainly in sections 7 and 8 devoted to "contiguity and distance in space and time". Disregarding the issue of space, it appears that through various examples Hume systematically uses the same approach. Independently of the specific intention or content relevant to the case, his approach leads us to compare the effects at the present date  $t_0$  of different pleasurable objects which are assumed to be available at various dates situated either in the future ( $t > t_0$ ), in the present ( $t = t_0$ ), or in the past ( $t < t_0$ ). This is the case, for instance, when, at the beginning of section 7, Hume asks his reader "to consider two kinds of objects, the contiguous and remote" (Hume 1739-40, 2.3.7.3), or at the end of section 3, on the occasion of the discussion of the reasons why men often counteract

---

<sup>6</sup>See, for instance, Hume (1751, 6.15). On the role of the calm passions, see John Immerwahr (1992) and, in relation to individual happiness, Lapidus (2011).



their own interest (Hume 1739-40, 2.3.3.10; see also the *Dissertation*, Hume 1757, 5.3-4). This corresponds to typical situations where Hume compares, at date  $t_0$ , two objects  $x$  (the contiguous) and  $x'$  (the remote) respectively available at dates  $t$  and  $t'$ , such that  $t' > t \geq t_0$ . In the terms of the formalization used in order to represent pleasure in relation to a set of choice and to the violence of the passion, this means that Hume discusses the perception, at date  $t_0$ , of elements  $(x, t)$  of a set of intertemporal choice  $X \times T$ , where  $T = [t_0, +\infty)$  stands for time.

Disregarding the specific influence on belief of the two other natural relations (resemblance and causality), the influence of contiguity entails that insofar as dates  $t$  different from  $t_0$  are taken into account, decision can no longer be viewed as determined by an impression of pleasure alone (that is, by  $p$ ) but, according to the violence of the passion, by the share of the strength and vivacity of this original impression which is transferred to the idea of a pleasure at date  $t$  (the belief in this pleasure), and which expresses itself in an emotional state, the desire for goods available at date  $t$ . In Hume's words, where he discusses the causes of belief,

[...] when any impression becomes present to us, it not only transports the mind to such ideas as are related to it, but likewise communicates to them a share of its force and vivacity. (Hume 1739-40, 1.3.8.2)

This amounts to saying that the desire  $u$  for  $x$  at date  $t$ , in an emotional state where the degree of violence of the passion is  $v$ , might be viewed as a “share”<sup>7</sup>  $h$  of the force of the original impression  $p$ . Note that since only contiguity matters,  $h$  does not depend on  $x$ , but only on  $v$  and  $t$ . And since  $h$  is a share, hence belonging to  $[0, 1]$ , it can be defined as:

$$\begin{aligned} h : V \times T &\rightarrow [0, 1] \\ (v, t) &\mapsto h(v, t) \end{aligned} \tag{3}$$

The resulting function of desire  $u$  is therefore:

$$\begin{aligned} u : X \times V \times T &\rightarrow \mathbb{R} \\ (x, v, t) &\mapsto u(x, v, t) \\ \text{where } u(x, v, t) &= h(v, t)p(x, v) \end{aligned} \tag{4}$$

Though quite general, a formulation like (4) will be familiar to economists acquainted with the perspective on intertemporal decision developed by Peter Fishburn and Ariel Rubinstein (1982).  $u$  looks like an extended intertemporal utility or desire function, which also depends on the emotional state of the individual as expressed by the violence of the passion. Note that  $u$  is said to be “extended” because it allows ordering not only time allocations  $(x, t)$  for a given degree of violence of the passion, but all possible  $(x, v, t)$ , thereby comparing these allocations according to alternative degrees of violence of the passion. Similarly,  $p$  looks like an extended standard function of utility, because it depends not only on  $x$  but also on  $v$ , just as the share  $h$  of the related impression  $p$

---

<sup>7</sup>This ensures that the original impression and the resulting belief have the same dimension. However, this position might be challenged on the basis of the *Enquiry*, in which Hume (1748, 5.11) uses a different and simpler phrasing which does not refer explicitly to a “share” of the force of an impression. Some scholars, like Francis Dauer (1999), concluded that Hume changed his position between the *Treatise* and the first *Enquiry*. We do not. But had we, this might have led to discuss the commensurability between pleasure and desire, even if we accept that they are represented by scalar magnitudes.

looks like an extended time discounting, because it depends not only on  $t$  but also on  $v$ .<sup>8,9</sup>

Hume's comments on the effects of belief in the case of intertemporal decision help complement the properties of the discount factor  $h$  and the desire function  $u$ . The basic principle comes at the beginning of the section on "contiguity and distance in space and time" (book 2, part 3, section 7), and rests on the understanding of the way our mind deals with remote objects:

'Tis obvious that the imagination can never totally forget the points of space and time in which we are existent; but receives such frequent advertisements of them from the passions and senses, that, however it may turn its attention to foreign and remote objects, it is necessitated every moment to reflect on the present. 'Tis also remarkable, that in the conception of those objects which we regard as real and existent, we take them in their proper order and situation, and never leap from one object to another, which is distant from it, without running over, at least in a cursory manner, all those objects which are interpos'd betwixt them. When we reflect, therefore, on any object distant from ourselves, we are oblig'd not only to reach it at first by passing thro' all the intermediate space betwixt ourselves and the object, but also to renew our progress every moment, being every moment recall'd to the consideration of ourselves and our present situation. 'Tis easily conceiv'd, that this interruption must weaken the idea, by breaking the action of the mind, and hindering the conception from being so intense and continued, as when we reflect on a nearer object. (Hume 1739-40, 2.3.7.2)

The conclusion is then straightforward:

The *fewer* steps we make to arrive at the object and the *smoother* the road is, this diminution of vivacity is less sensibly felt, but still may be observ'd more or less in proportion to the degrees of distance and difficulty. (Hume 1739-40, 2.3.7.2)

Hume's ensuing discussions in sections 7 and 8, devoted to temporal distance, have in common the recognition of the loss in force and vivacity of the idea of a remote object when compared to that of a contiguous object. He distinguishes two mechanisms by which temporal distance decreases the force of the desire for a remote object. On the one hand, the degree of "distance" makes  $h$  equal to 1 when  $t = t_0$ , and then decreasing in  $t$ . On the other hand, the degree of "difficulty" of the road (or conversely, its smoothness) refers to the depreciation of future goods relative to present ones, and is all the more important since the part played by the natural relation of contiguity is itself important. Whereas the first mechanism is, broadly spoken, rather familiar, the second one is more specific to Hume. The part played by contiguity is governed by the degree of violence of the passion, that is by  $v$ . A consequence of this approach to the action of the emotional state on the strength of the idea of a future good is an alternative way to understand the calm passion. In one of the most famous passages of the *Treatise* Hume introduces the calm passion as an emotional state in which the relation of contiguity is neutralized, since a remote good is not depreciated:

---

<sup>8</sup>A referee for this journal suggested that the  $v$  in the pleasure function  $p$  might be different from the one in the discount function  $h$ . If so,  $v$  would be linked to the emotional state in which the pleasure of  $x$  is experienced. This wouldn't drastically change the rest of the paper and could be an interesting simplification. However, we think that it would move us too far away from Hume's understanding of a passion, and of its degree of violence, as a modality of pleasure and pain — that is, as a way to live them, so that when the violence of my passion leads me to a weaker belief in  $h$ , it also determines the way I expect my impression of pleasure  $p$ : if I were ready to consider my expected pleasure in a, say, calmer way, this would also be the way I believed in it.

<sup>9</sup>Note also that the separability of  $u$  in (4) relies strongly on the fact that Hume views the belief expressed in  $h$  as a *share* of the initial impression given by  $p$ . Separability is therefore a primitive of the representation, whereas in the usual approach it is a consequence of an axiomatic property of intertemporal preferences, weaker than stationarity, like the Thomsen condition (see axiom A6 and theorem 4 in Fishburn and Rubinstein 1982, pp. 686-87).

Men often act knowingly against their interest; for which reason, the view of the greatest possible good does not always influence them. Men often counteract a violent passion in prosecution of their interests and designs; it is not, therefore, the present uneasiness alone which determines them. In general we may observe that both these principles operate on the will; and where they are contrary, that either of them prevails, according to the *general* character or *present* disposition of the person. What we call strength of mind, implies the prevalence of the calm passions above the violent. (Hume 1739-40, 2.3.3.10)

The calm passion therefore appears not only as the emotional state in which we draw from goods the greatest pleasure: it is also the state in which whatever the “distance” between us and the object which pleases us, the “difficulty” in reaching it is so weak that future goods are the least discounted, thus allowing desire to express pleasure without loss of force and vivacity.

Summing up the previous remarks, we can conclude that the share  $h$  of the related impression (the discount factor) is decreasing in  $t$  and in  $v$ ; that when the impression occurs at date  $t_0$ , it is always equal to 1 whatever the violence of the passion; and that under a calm passion, it is also equal to 1, whatever the date when the related impression occurs. As a result of each of the previous propositions, the desire function  $u$  shows the following properties, assuming for sake of convenience that  $t_0 = 0$  and, therefore,  $T = \mathbb{R}^+$ :

$$\forall (x, v) \in X \times V \text{ and } s, t \in T, \text{ such that } s \geq t, \text{ then } u(x, v, t) \geq u(x, v, s) \quad (5a)$$

$$\forall (x, t) \in X \times T \text{ and } v, w \in V, \text{ such that } v \geq w, \text{ then } u(x, w, t) \geq u(x, v, t) \quad (5b)$$

$$\forall (x, v) \in X \times V, \text{ then } u(x, v, 0) = p(x, v) \quad (5c)$$

$$\forall (x, t) \in X \times T, \text{ then } u(x, \hat{v}, t) = p(x, \hat{v}) \quad (5d)$$

Note that (5a) is a property of  $u$ , playing the same role as the usual axiom of “impatience” which Fishburn and Rubinstein (1982, p. 680) elaborated, following Böhm-Bawerk (1889, pp. 237-59) and Koopmans (1960, p. 296) — an axiom whose consequence is that the desire function  $u$  is decreasing with time.<sup>10</sup> At this stage, however, we do not know much about the behavior of the discount factor and its impact on the intertemporal function of desire.

### 3 Distance and difficulty: a Humean approach to decision in time

The explanation of the weakening of the desire for a future good in the *Treatise* draws on a metaphor of the “road” we have to travel to reach it: Hume distinguishes the “distance”, related to the time-length between a present moment and a remote object, and the “difficulty”, related to the emotional state — the violence of the passion (Hume 1739-40, 2.3.7.2). Both the distance and the difficulty contribute to explaining why such a remote object is the object of a desire which is weaker than the one which would have been felt in case the object was present. Up until now, distance and difficulty have been discussed separately, through their respective effects on the share of the original impression and, for difficulty only, on the intensity of the resulting impression of

<sup>10</sup>Hume again addressed the consequence of impatience in the third book of the *Treatise*, in order to explain our tendency to injustice: “You have the same propension that I have in favour of what is contiguous above what is remote. You are, therefore, naturally carried to commit acts of injustice as well as me” (Hume 1739-40, 3.2.7.3).

pleasure. Nonetheless, Hume also explored some aspects of their interplay, proceeding in two steps which lead to a progressively more sophisticated account of intertemporal decision.

### 3.1 Decision in time “abstractedly considered”: exponential discounting

The first step represents a cognitive landmark, introduced in the *Treatise* where Hume discusses the respective effects of past and future intervals in time, and which assigns to impatience a certain kind of regularity. The starting point is a thought experiment:

When, from the present instant, we consider two points of time equally distant in the future and in the past, it is evident that, abstractedly considered, their relation to the present is almost equal. For as the future will some time be present, so the past was once present. If we could, therefore, remove this quality of the imagination, an equal distance in the past and in the future would have a similar influence. (Hume 1739-40, 2.3.7.9)

The way Hume takes up this issue is of special interest. When he considered two intervals in time *abstractedly*, he did so with two equal intervals, say  $[-t, 0]$  and  $[0, t]$ . But now the mental operation (removing a “quality of the imagination”) on which he bases his conclusion that “an equal distance [...] would have a similar influence” is not limited to the comparison between past and future: it can engage in comparisons not only between a past and a future interval, respectively ending and beginning at date  $t_0 = 0$ , but between any pair of temporal intervals of equal magnitude, and especially between future intervals. Hume himself suggested the possibility of extending his own approach, as is clear from the way he continues his remark on the comparative influence of past and future intervals “abstractedly considered”:

Nor is this only true when the fancy remains fixed, and from the present instant surveys the future and the past; but also when it changes its situation, and places us in different periods of time. For as, on the one hand, in supposing ourselves existent in a point of time interposed betwixt the present instant and the future object [...] (Hume 1739-40, 2.3.7.9)

Consider therefore two equal intervals of time of length  $\tau$ , at dates  $t$  and  $t'$ , and assume  $(x, v)$  and  $(x', v)$  such that  $(x, v)$  at date  $t$  is equally desirable as  $(x', v)$  at date  $t + \tau$ . The “similar influence” argument leads us to conclude that this equal desirability still holds for the respective dates  $t'$  and  $t' + \tau$ . More formally,

$$\begin{aligned} \forall (x, v), (x', v) \in X \times V, \text{ and } t, t + \tau, t', t' + \tau \in T, \\ u(x, v, t) = u(x', v, t + \tau) \Rightarrow u(x, v, t') = u(x', v, t' + \tau) \end{aligned} \tag{5e}$$

It is easy to recognize in (5e) a transposition of the axiom of stationarity (see Fishburn and Rubinstein 1982, p. 680). This in turn leads us to conclude that decision in time “abstractedly considered” can be represented by a desire function  $u$  which shows the usual characteristics of an exponential discounted utility function (see Appendix) in which

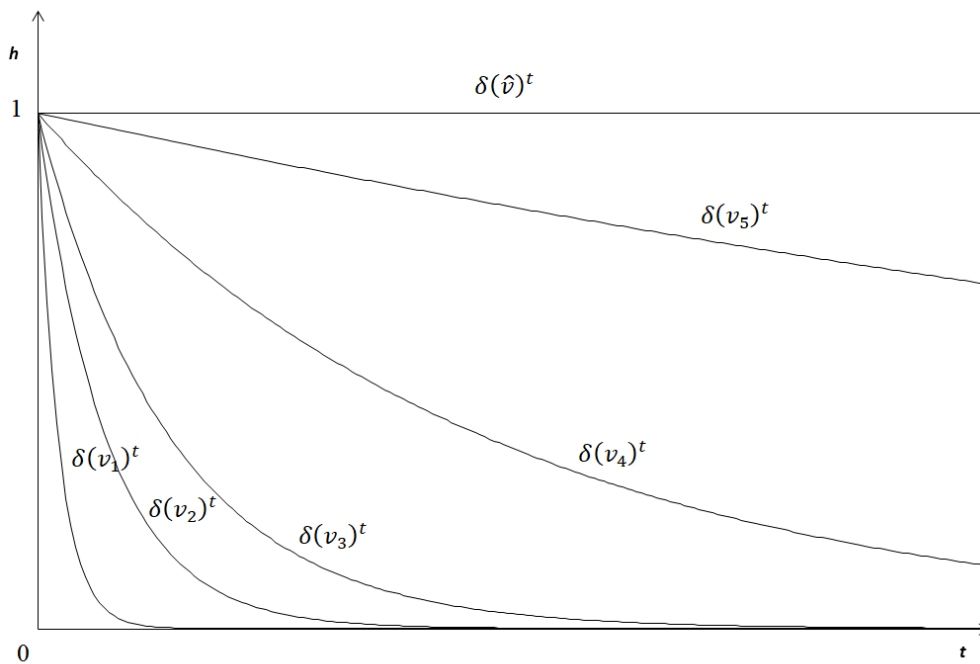
$$h(v, t) = \delta(v)^t$$

so that it can be written:

$$u(x, v, t) = \delta(v)^t p(x, v) \quad (6)$$

(where  $0 \leq \delta(v) \leq 1$ )

For any given “difficulty” (in Hume’s words) — that is, for any given value of the degree of violence of the passion  $v$  — the desire function in (6) shares the properties of a standard exponential discounted utility function. In particular, the discount factor  $\delta(v)$ , decreasing in the difficulty  $v$ , can be viewed as fixed for any given  $v$ , and related to a non-negative discount rate  $r = \frac{1}{\delta(v)} - 1$ , also depending on  $v$ . The resulting curves of time discounting  $h = \delta(v_i)^t$  are represented in figure 1, each of them depending on a degree of violence of the passion:  $v_1 > v_2 > \dots > \hat{v}$ .



**Figure 1:** Time discounting “abstractedly considered”: exponential discounting  $h = \delta(v_i)^t$   
 $v_1 = 1.1$ ;  $v_2 = 0.7$ ;  $v_3 = 0.5$ ;  $v_4 = 0.3$ ;  $v_5 = 0.22$ ;  $\hat{v} = 0.2$   
 $\delta(v_i) = 1 + b - v_i$  ( $b = 0.2$ )  
 $\delta(v_1) = 0.1$ ;  $\delta(v_2) = 0.5$ ;  $\delta(v_3) = 0.7$ ;  $\delta(v_4) = 0.9$ ;  $\delta(v_5) = 0.98$ ;  $\delta(\hat{v}) = 1$

It is well known that, owing to a stationarity property like (5e), exponential discounting is *statically* time-consistent, which means that as long as our emotional state expressed by  $v_i$  remains stable, if  $x_A$  at date  $t_1$  is less desired than  $x_B$  at date  $\theta_1 = t_1 + s$ , the order of preference is preserved for any other date  $t_2$ , provided the time distance between  $x_A$  and  $x_B$  remains  $s$ . From a Humean point of view, this means that if our intertemporal desires were shaped in this way then, “abstractedly considered”, if our tastes (say, the pleasure function  $p$ ) and our emotional state (the difficulty, or the degree of violence  $v$ ) do not depend on time (that is, are time-invariant), any commitment based on intertemporal desires (like  $x_B$  being preferred to  $x_A$ ) can be viewed as credible, since we have no reason to modify our preferences with the passage of time, meaning that *they are dynamically* time-consistent. On the contrary, variations in  $v$  when time passes open the path to possible dynamic time-inconsistency.

### 3.2 Humean discounting and the issue of time-consistency

When Hume deals with decision in time “abstractedly considered”, he views “difficulty”, the degree of violence of the passions, as an independent magnitude which influences the magnitude of both the impression of pleasure and the associated belief, represented by a discount factor. The second step of the reconstruction leads to him giving up this abstract consideration in order to favor not simply any kind of influence on the degree of violence of the passions, but only that which is conveyed by the natural flow of time, in other words the effect on “difficulty” of the decrease of “distance”.

Even before his treatment of contiguity and distance, Hume had emphasized the influence of the time of a future event on the violence of the passions where he argued that “the same good, when near, will cause a violent passion, which, when remote, produces only a calm one” (Hume 1739-40, 2.3.4.1). Albeit in different words, the same idea also appears in the second *Enquiry* (Hume 1751, 6.15) and in the *Dissertation* (Hume 1757, 5.3), namely of (i) an increase in the degree of violence of the passion when the time of availability of the previously remote object approaches; and on the contrary of (ii) a calm passion, which imposes itself when the object is sufficiently distant. This amounts to making explicit the part played by the time distance  $t$  as a determinant of  $v$ , the violence of the passions:

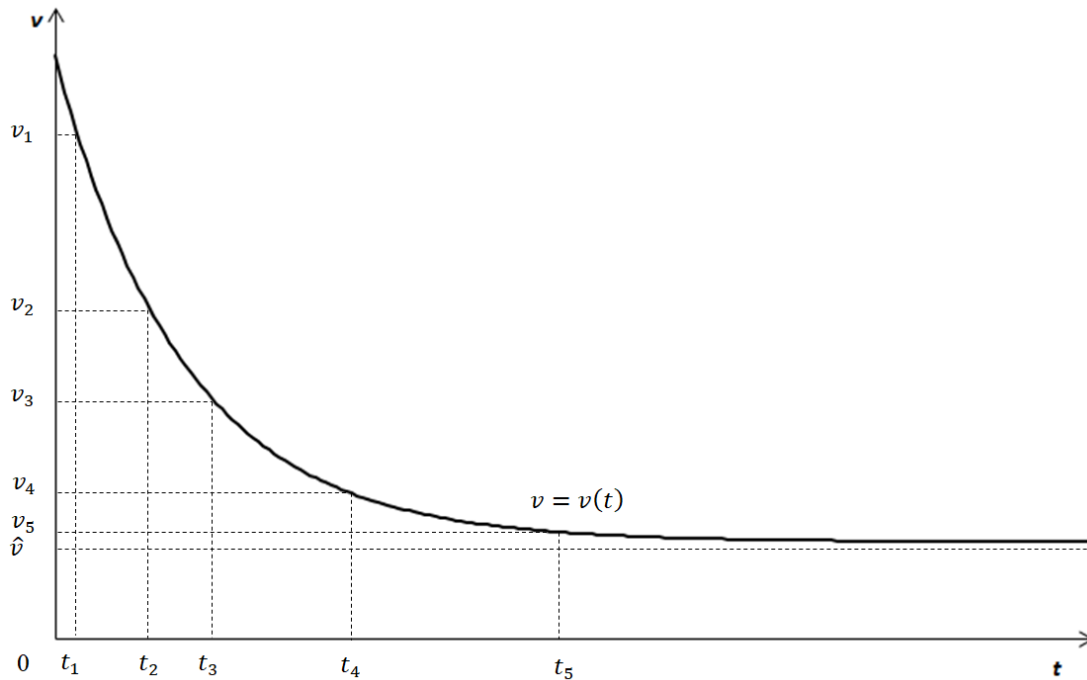
$$\begin{aligned} v : T &\rightarrow V & (7) \\ t &\mapsto v(t) \\ \text{with } v(0) &\geq \hat{v}, \frac{\partial v}{\partial t} \leq 0 \text{ and } \lim_{t \rightarrow +\infty} v(t) = \hat{v} \end{aligned}$$

In figure 2, for instance,  $v$  decreases from  $v_1$  at date  $t_1$  to  $v_2$  at  $t_2$ , and then increasingly approaches  $\hat{v}$ .

In book 3 of the *Treatise*, Hume appeals to the effect of time upon the violence of passions in order to account for such matters as the origin of the observance of the rules of justice, stressing that when they concern a remote enough future, our desires lead us toward what pleases us the most, that is, to what is conveyed by a calm passion:

When we consider any objects at a distance, all their minute distinctions vanish, and we always give the preference to whatever is in itself preferable [*i.e.*, is providing the greater pleasure], without considering its situation and circumstances [that is, if relative to other objects, it is more or less close or remote]. [...] In reflecting on any action which I am to perform a twelvemonth hence, I always resolve to prefer the greater good [*i.e.*, the greater pleasure (see Hume 1739-40, 1.3.10.2; 2.3.9.8)], whether at that time it will be more contiguous or remote; nor does any difference in that particular make a difference in my present intentions and resolutions. My distance from the final determination makes all those minute differences vanish, nor am I affected by any thing but the general and more discernible qualities of good and evil [*i.e.*, of pleasure and pain] (Hume 1739-40, 3.2.7.5).

At first sight, Hume simply draws out the consequences of the fact that our emotional state becomes calmer as the time distance which separates us from the objects that we are considering increases – to such an extent, he argues, that at twelve months’ distance, only pleasure and pain matter and no discounting effect occurs. The previous quotation — which focused on “objects at a distance”



**Figure 2:** Time and degree of violence of the passion

$$v = \frac{1}{a^t} + b; a = 1.5; b = 0.2$$

— continues as follows, stressing the consequences of a decrease in this distance when time passes:

But on my nearer approach, those circumstances which I at first overlook'd [the availability of objects at different times] begin to appear, and have an influence on my conduct and affections. A new inclination to the present good springs up, and makes it difficult for me to adhere inflexibly to my first purpose and resolution. (Hume 1739-40, 3.2.7.5)

Hume now assigns utmost importance to the fact that the already close object, call it  $x_A$ , is becoming nearer still.<sup>11</sup> Such a move changes our emotional state, the degree of violence of the passion becoming higher. Assume, for instance, that  $x_A$  is available at date  $t$ , whereas another object  $x_B$  is available at  $\theta = t + s$ . Suppose also that in the initial situation noted by Hume, when  $x_A$  is remote enough ( $t$  is large enough) for the passion to be calm ( $v \approx \hat{v}$ ), so that as Hume puts it “I always resolve to prefer the greater good”,  $x_B$  is this greater good, and hence is preferred to  $x_A$ . When  $x_A$  becomes closer,  $v$  increases from  $\hat{v}$  till  $v(t)$ , and the time-distance  $s$  between  $t$  and  $\theta$ , though constant, becomes more “difficult” to traverse: as Hume says, “those circumstances which I at first overlooked begin to appear”. The pleasures associated to  $x_A$  and  $x_B$  are now respectively discounted by  $\delta(v(t))^t$  and  $\delta(v(t))^\theta$ . Intuitively, since  $\delta(v(t))^\theta < \delta(v(t))^t$ , the discounting of the pleasure associated to  $x_B$  might be so important that the closer object  $x_A$  becomes the preferred one: in Hume’s words, a “new inclination to the present good springs up”. This is clearly a description of *dynamic* time-inconsistency.

This could be investigated more formally. From (6) and (7), it becomes possible to express the intertemporal desire  $u$  as depending only on the amount of an object  $x$ , on the date  $t$  of

<sup>11</sup>In what follows it is supposed that the degree of violence of the passion is determined by the date of availability of the closer object. But the argument would remain the same if the determining date had been any other date of availability of another object, or if it had been a combination of these dates.

availability of the nearer object, which determines the degree of violence of passions, and on the date of availability of  $x$ ,  $\theta \geq t$ :

$$\begin{aligned}
 u(x, v(t), \theta) &= h(v(t), \theta) p(x, v(t)) \\
 &\text{(where } h(v(t), \theta) = \delta(v(t))^\theta \\
 &\text{and } 0 \leq \delta(v(t)) \leq 1)
 \end{aligned} \tag{8}$$

The crucial feature concerns the properties of the discounting function  $h$  in (8). When the date of availability of the closer object is  $\bar{t}$ ,  $v(\bar{t})$  can be considered as given, so that the discounting function can be written

$$\begin{aligned}
 h(v(\bar{t}), \theta) &= \delta(v(\bar{t}))^\theta \\
 &\text{(with } 0 \leq \delta(v(\bar{t})) \leq 1)
 \end{aligned} \tag{9}$$

Note that as a result, at any moment, when the degree of violence of the passion can be viewed as given since it is determined only by the date of availability of the closer object, every other object available at  $\theta \geq \bar{t}$  is discounted exponentially. This means that at  $\bar{t}$ , stationarity in the sense of (5e) holds (with  $v = v(\bar{t})$ ) and *decision is statically time-consistent*.

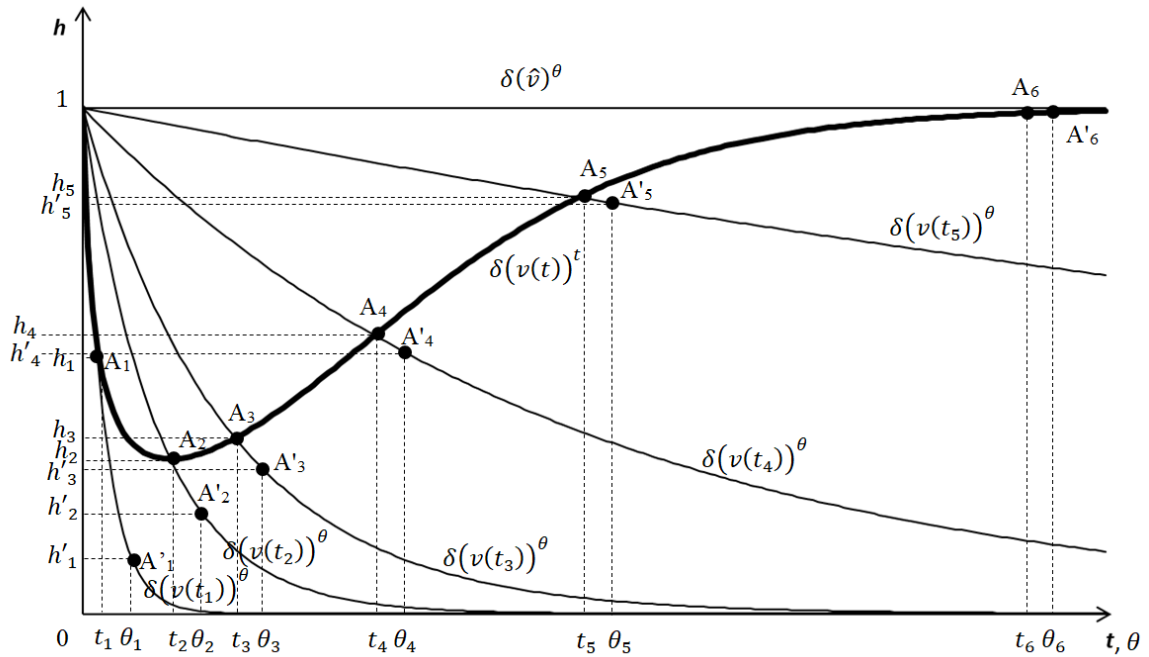
This is no longer the case if the course of time is taken into account. Consider again the two objects  $x_A$  and  $x_B$  separated in time by  $s$ . Their dates of availability  $t_i$  and  $\theta_i$  and the discounts  $h_i$  and  $h'_i$  applied to the pleasures they provide are given in figure 3 by the coordinates of the successive pairs  $(A_i, A'_i)$ . As time passes,  $x_A$  and  $x_B$  are first represented by  $(A_6, A'_6)$ , then by  $(A_5, A'_5)$ , and finally by  $(A_1, A'_1)$ . The graph of  $h(v(t), t) = \delta(v(t))^t$ , represented by the bold curve in figure (3), is of special interest. It takes into account the changes in the violence of the passions in order to show, at each date, the discount applied to  $x_A$ , the object which determines the difficulty of covering the various time-distances.  $A_1$  and  $A_2$ , for instance, which are located on the curve  $\delta(v(t))^t$ , do not express the respective discounts applied to two separate objects available at dates  $t_1$  and  $t_2$ . They are the same object,  $x_A$ , first available at  $t_2$  and then, as time passes, at  $t_1$ . Between  $t_2$  and  $t_1$ , the violence of the passion has increased, since  $x_A$  has come nearer. From a certain point of view, this shows that  $x_A$  is more desired when at  $t_1$  than at  $t_2$ . Note, however, that there is no real choice between them: it cannot be a choice performed between two identical objects, one close and the other remote, in a given emotional state, because  $A_1$  and  $A_2$  refer to two emotional states which cannot be felt simultaneously. The actual choices are between  $x_A$  and  $x_B$ : (1) when we know that we could obtain them after a period  $t_2$  for the former and  $\theta_2 = t_2 + s$  for the latter; and (2) when they become available at respectively  $t_1$  and  $\theta_1$ , so that the violence of our passion has increased from  $v(t_2)$  to  $v(t_1)$  because  $x_A$  has come nearer. They are respectively represented by the familiar graphs of the exponential discounting functions  $\delta(v(t_2))^\theta$  and  $\delta(v(t_1))^\theta$ . By contrast, the graph of the pseudo-discounting function  $\delta(v(t))^t$  is U-shaped, because of the conflicting effects of  $t$ , negative as an exponent of the discount factor  $\delta(v(t))$ , and positive through the degree of violence of the passion which decreases with time.<sup>12</sup>

The evolution of time discounting relative to  $x_A$  and  $x_B$  is shown in figure 3, assuming they are first available at dates  $t_6$  and  $\theta_6 = t_6 + s$  that is, at dates remote enough for them to be considered under a calm passion ( $v(t_6) \approx \hat{v}$ ), so that they do not suffer any relative nor absolute discounting ( $\delta(v(t_6))^{t_6} \approx \delta(v(t_6))^{\theta_6} \approx \delta(\hat{v}) = 1$ ), as shown by the common ordinate of  $A_6$  and  $A'_6$ . Then,

---

<sup>12</sup>The U-shape pseudo-discounting curve might also be interpreted as the set corresponding to the provisional discounting which occurs when our emotional state is not yet stabilized, as Hume often argues when our mind passes from one object and one emotional state to another (see, for instance, the dynamics of passions which Hume introduces in the discussion of the direct passions in the *Treatise*, Hume 1739-40, 2.3.9.3-4).





**Figure 3:** Humean map of discounting:

$$\delta(v(t))^t = (1 + b - v(t))^t = \left(1 - \frac{1}{a^t}\right)^t; \quad \delta(v_i)^\theta = (1 + b - v(t_i))^\theta = \left(1 - \frac{1}{a^{t_i}}\right)^\theta; \quad a = 1.5; b = 0.2$$

assume that time has passed, so that  $x_A$  has come closer — now being available after a period  $t_5$ .  $x_A$  and  $x_B$  are represented in figure 3 by  $A_5$  and  $A'_5$ . The violence of the passion increases from  $\hat{v}$  to  $v(t_5)$ , so that the time-distance  $s$  between the dates  $t_5$  and  $\theta_5$  of availability of  $x_A$  and  $x_B$  is getting more difficult to cover. Consequently, a discount of the pleasure of  $x_B$  relative to that of  $x_A$  is developing. It is expressed by the distance between the ordinates of  $A_5$  and  $A'_5$ ,  $h_5 = \delta(v(t_5))^{t_5}$  and  $h'_5 = \delta(v(t_5))^{\theta_5}$ . As time keeps on passing,  $x_A$  and  $x_B$  are represented successively by  $A_4$  and  $A'_4$ , ... , and  $A_1$  and  $A'_1$ , showing that the same time-distance  $s$  is increasingly difficult to cover: the difference between the discounts associated with  $x_A$  and  $x_B$  grows until it is  $h_1 - h'_1$  for  $A_1$  and  $A'_1$ .<sup>13</sup> Although, initially,  $x_B$  was preferred to  $x_A$  because they were remote enough and the pleasure provided by  $x_B$  was determining, when they get nearer the discount of  $x_B$  might become so significant as to reverse the preferences and make  $x_A$  preferred to  $x_B$ . It is obvious that although static time-consistency holds at any single moment owing to stationarity (5e), taking

<sup>13</sup>This way of proceeding means that we purposefully adhere to Strotz's rejection of what he called "calendar preferences" in contrast to the preferences which stem from the flow of time alone (Strotz 1956). Yet an observation from the first *Enquiry* might lead to a qualification of this position. Discussing the origin of self-command and of its variations, Hume illustrated his point by arguing that "[w]e are more master of our thoughts in the morning than in the evening" (Hume 1748, 7.19; we are indebted to a referee of this *Journal* for drawing our attention to this passage). Since self-command is related to the degree of violence of the passions, this would imply that in the morning the latter is smaller than in the evening and, as a result, that  $v(t)$  is not strictly monotonous but rather shows cyclical variations within a general decreasing trend. On first view, this daily oscillation should be considered out of the scope of intertemporal choice, since it comes within calendar preferences. But on second thought it might be argued that taking into account the dependence of  $v$  on  $t$  also falls in some manner within the scope of calendar preferences. If so, there is no reason to reject daily variations. This would not seriously challenge our conclusions. The cycles within the trend of  $v(t)$  would be reflected in the discounting factor  $\delta(v(t))$ , making remote desirable objects less discounted relative to contiguous ones at the beginning of the day than at its end. Instead of a monotonous movement in figure 3 from  $A_6$  to  $A_1$ , the movement might be, for instance, from  $A_6$  in the morning to  $A_4$  in the evening, and then to  $A_5$  the next morning and  $A_3$  the following evening, etc. It's therefore obvious that incorporating daily oscillations into the analysis doesn't change the general argument, but introduces an additional complication in the representation of decision in time. This is why, apart from its possibly excessive contamination by calendar preferences, daily oscillations have been neglected above.

into account the successions of the different moments in the flow of time allows the violence of the passion to change so that we no longer meet the conditions where (5e) holds and *dynamic time-inconsistency can occur*. This is consistent with Palacios-Huerta's (2003) conclusion that Humean decision in time displays time-inconsistency — though it does not entail a representation of Hume's discounting by a hyperbolic or quasi-hyperbolic function.

## 4 Concluding remarks: Government, as a remedy to impatience and time inconsistency

There is no quality in human nature, which causes more fatal errors in our conduct than that which leads us to prefer whatever is present to the distant and remote, and makes us desire objects more according to their situation [present or remote] than their intrinsic value [the pleasure they produce]. (Hume 1739-40, 3.2.8.8; see also Hume 1751, 4.1)

The properties assigned to the calm passion lie at the heart of Hume's account of decision in time, and they particularly influence his account of the negative consequences of what we have called impatience. The calm passion may certainly be linked to its social, religious and political effects (see Immerwahr 1992), but it is also linked to individual effects as regards decision and welfare (Lapidus 2010, 2011): it drives us towards what pleases us the most and, moreover, places us in the emotional state where our choices give us the greatest pleasure. Hence, what seems to have puzzled Hume the most is not so much that our choices might be dynamically time-inconsistent, than that they deviate from those that a calm passion would have directed us to. In other words, the problem is *impatience* (5a), from which the discount of future objects is derived, rather than the possible transgression of *stationarity* in the flow of time (condition (5e) not fulfilled), which allows time-inconsistency:

However, that there really is a problem with impatience is far from self-evident. With respect to the typical opposition between full acceptance of impatience, and the view that impatience stands in need of being “cured”, Hume would be clearly on the side of the latter. In other words, he sides with Rawls (1971, pp. 259-62), for whom impatience should be avoided on the basis of an impartial concern for all the parts of our lives, but not with Parfit (1971, p. 99), for whom impatience is all the more admissible since it results from the separation between a present and a future self. Equally, Hume might be seen as agreeing with the early Anglo-Saxon marginalist tradition which runs from Jevons to Marshall, Fisher and Pigou (see Peart 2000), to which we might add such authors as Rae or Böhm-Bawerk, which considers impatience as a kind of mental weakness or deficiency.

Hume's position on impatience is quite general in its scope, since it covers all the aspects of decision insofar as it has an intertemporal dimension. It accounts both for the individual strategies which result in a tranquillization of the passion, and for the promotion of the calm passion through public policies — what Sturn (2004, p. 363) called the “sentiment-correcting function” of the calm passion. The modalities of these strategies and policies were introduced mainly in the *Essays*, upon which Hume worked from the 1740s till his death (Hume 1777), notably the Sceptic (1742), the Delicacy of Taste and Passion (1741) and the Refinement in the Arts (1752) (see Lapidus 2011). Yet it also raises a more specific issue, which Hume considers to be the most serious consequence

of impatience — the faulty observance of the rules of justice on which life in society depends. As Hume puts it:

This [preference granted to the present] is the reason why men so often act in contradiction to their known interest [their greatest pleasure]; and, in particular, why they prefer any trivial advantage that is present, to the maintenance of order in society, which so much depends on the observance of justice. (Hume 1739-40, 3.2.7.3)

But the subtlety of Hume’s approach rests on a distinction between what is painful to him, as a philosopher interested in the well-being of humankind, and what is perceived as immediately painful to the individual concerned, which has decisional effects. Whereas the former depends on the universality of time discounting, and thus on impatience, the latter rests on time inconsistency, and thus on non-stationarity. On the whole, the part played by intertemporal decision in the section of the *Treatise* devoted to the origin of government has been brought out in Hume scholarship, although the issues raised by impatience have not been clearly distinguished from those raised by non-stationarity.

For instance, John L. Mackie drew on two kinds of arguments. In the first one, we recognize impatience: “human beings have a deplorable tendency to prefer smaller immediate advantages to greater remote ones” (Mackie 1980, pp. 106-7). The second argument, explicitly related to Hobbes, amounts to the sub-optimality of the equilibrium of a non-cooperative game: “if I know that you are liable to do this, I cannot rely on your conformity, even if I conform; and then it will not after all be even in my long-term interest to conform” (Mackie 1980, p. 107; note, however, that this is not necessarily the case if the game is repeated). Annette Baier also focused on the part played by impatience in presenting government as a means “to make what is in our long-term interest also in our short-term interest” (Baier 1991, p. 255). The same could be said of Hardin, who argued that “[t]he trick is to change our circumstances to make us observe the laws of justice as our nearest interest” (Hardin 2007, p. 116). But here again, the specificity of non-stationarity and the related time-inconsistency were ignored. Rachel Cohon also emphasized the role of impatience, which she called “temporal myopia” (Cohon 2008, p. 219); although she should be acknowledged for her intuition concerning dynamic time-inconsistency. Using a different vocabulary, she views this as a particular case of impatience, that is as a “further feature of temporal myopia [which] helps them [the individuals] consent to future constraints for the sake of gain in the more distant future” (Cohon 2008, p. 220). This leads her to conclude that “[b]ecause of their general ‘negligence about remote objects’, they do not react to the intervals between separate events when both events are far enough in the future; they attend only to the relative magnitude of the goods to be produced”, and to identify this “further feature” as the source of the consent of the people to the action of a government which leads us to choose what fulfills our long-term interests (Cohon 2008, p. 220; see also p. 221).

Now, the distinction between impatience and dynamic time-consistency is crucial. As individuals, we can put up with impatience: in spite of the philosopher’s aversion to such a universal weakness, we do not really suffer from the discount placed on future pleasures. But when our discounting procedure shows itself to be time-inconsistent, we cannot put up with it: we suffer from the modification of our preferences when nothing else happens other than the passage of time, and when we realize this,

[t]ho’ we may be fully convinc’d that the latter object [the remote] excels the former [the contiguous], we are not able to regulate our actions by this judgment, but yield to

the solicitations of our passions, which always plead in favour of whatever is near and contiguous. (Hume 1739-40, 3.2.7.2)

Hume describes this situation as a “weakness” to which “all men are, in some degree, subject” (Hume 1739-40, 3.2.7.3). Not only will our preferences change when the objects we are considering draw nearer — when, as in figure 3,  $x_A$  comes nearer, from a distance  $t_6$  to a distance  $t_1$  — but we are also fully aware, when  $x_A$  is still in  $t_6$ , of this change which is to take place when  $x_A$  is in  $t_1$ . Hence we are prone, when  $x_A$  is in  $t_6$ , to search for a remedy to the imposition of future choices which do not fit our present preferences. On first view (“a cursory view”, Hume says), this seems insoluble, and Hume was clearly conscious of the logical trap:

This quality [preference given to the most contiguous] [...] also seems, on a cursory view, to be incapable of any remedy. The remedy can only come from the consent of men; and if men be incapable of themselves to prefer remote to contiguous, they will never consent to any thing which would oblige them to such a choice, and contradict, in so sensible a manner, their natural principles and propensities. (Hume 1739-40, 3.2.7.4)

He depicts our repeated and ineffective attempts to find a solution in order to cure such a “natural infirmity”: “I may have recourse to study and reflection within myself; to the advice of friends; to frequent meditation, and repeated resolution” (Hume 1739-40, 3.2.7.5). And in the end he presents an implementable solution, in which it is easy to recognize a standard solution (actually, an *external constraint* which Hume called “a restraint upon myself”) to a multiple-self problem of the type Ulysses and the Sirens (Elster 1977):

And having experienced how ineffectual all these are, I may embrace with pleasure any other expedient by which I may impose a restraint upon myself, and guard against this weakness. (Hume 1739-40, 3.2.7.5)

This “other expedient” is well known: it consists in transferring, today, the implementation of our future choices to people whose short-term interest concerns these remote choices that tomorrow we know we will no longer be able to support. Hume’s argument is worth quoting at length, since it opens the path to his explanation of the origin of government:<sup>14</sup>

The only difficulty, therefore, is to find out this expedient, by which men cure their natural weakness, and lay themselves under the necessity of observing the laws of justice and equity, notwithstanding their violent propensity to prefer contiguous to remote. It is evident such a remedy can never be effectual without correcting this propensity; and as it is impossible to change or correct any thing material in our nature, the utmost we can do is to change our circumstances and situation, and render the observance of the laws of justice our nearest interest, and their violation our most remote. But this being impracticable with respect to all mankind, it can only take place with respect to

---

<sup>14</sup>It is usually argued that Hume modified his position between his early developments on “the origin of government” in book 3, part 2, section 7 of the *Treatise* and the last essay he wrote, under the same title, in 1774 (Hume 1777, pp. 37-41). See, for instance, Haakonssen (2009, p. 355), who suggested that in the *Essays*, where they differ from the *Treatise*, Hume concluded that the habit of submission during the time of war bore the main responsibility for the origin of government. Yet, in this short essay, Hume confirmed the part played by impatience, though in less detail than in the *Treatise* and without fully completing his argument (note, however, that the essay is less than five pages in length): “But much more frequently, he [man] is seduced from his great and important, but distant interests, by the allurements of present, though often very frivolous temptations. This great weakness is incurable in human nature” (Hume 1777, Of the Origin of Government [1774], p. 38). More generally, on the issue of Hume’s change or continuity from the *Treatise* to the *Essays* in his explanation of the origin of government, see chap. 1 of Okan (2018), who also inclined toward continuity.

a few, whom we thus immediately interest in the execution of justice. These are the persons whom we call civil magistrates, kings and their ministers, our governors and rulers, who, being indifferent persons to the greatest part of the state, have no interest, or but a remote one, in any act of injustice; and, being satisfied with their present condition, and with their part in society, have an immediate interest in every execution of justice, which is so necessary to the upholding of society. Here, then, is the origin of civil government and society. Men are not able radically to cure, either in themselves or others, that narrowness of soul which makes them prefer the present to the remote. They cannot change their natures. All they can do is to change their situation, and render the observance of justice the immediate interest of some particular persons, and its violation their more remote. These persons, then, are not only induced to observe those rules in their own conduct, but also to constrain others to a like regularity, and enforce the dictates of equity through the whole society. (Hume 1739-40, 3.2.7.6; see also 3.2.10.2)

Hume’s argument is brilliant. As individuals, we do not have a special aversion against impatience, but we do have an aversion against dynamic time-inconsistency. This might have encouraged us to support a government constituted by possibly impatient people, provided they were time-consistent – which would surely be the case if they considered “abstractedly” the time within which they made their decisions. But such impatient people, able to consider time “abstractedly”, simply do not exist: the “natural infirmity” which gives a lesser importance to remote objects is all the more universal since it rests on the natural relation of contiguity which also makes the violence of the passion decrease with the delay in availability of the remote object, thus producing time-inconsistency. Hence we cannot avoid supporting, as our governors, people who are, like everybody, more or less prone to impatience, provided that their immediate interest is that we do not decide according to the comparatively lesser importance that we grant to a remote object. If we are led for this reason to keep our decisions unchanged in spite of the passing of time, we behave as if we were under the influence of a calm passion. In some issues crucial to social life, like the observance of the rules of justice, this means that although we are searching only for a means to cancel time-inconsistency, we in fact give birth to an institutional device which keeps us on the path that a calm passion would have marked out.

## Appendix: Decision in time “abstractedly considered”

**Proposition.** *Let  $u$  denote a desire function  $X \times V \times T \rightarrow \mathbb{R}$  such that, as in (4),  $u(x, v, t) = h(v, t)p(x, v)$ , with  $p$  and  $h$  respectively defined by (1) and (3). Assuming (2a)-(2d) and (5a)-(5e), then*

$$u(x, v, t) = \delta(v)^t p(x, v)$$

(where  $0 \leq \delta(v) \leq 1$ )

*Proof.* Let us state  $u_v(x, t)$  the function derived from  $u$  by considering  $v$  as fixed. It writes, according to theorem 2 of Fishburn and Rubinstein (1982, p. 682),  $u_v(x, t) = \delta_v^t f_v(x)$  with  $0 \leq \delta_v^t \leq 1$  and  $f_v$  is an increasing function of  $x$ .  $\delta_v$  and  $f_v$  depend on  $v$  because  $u_v$  is a parametrized function (by  $v$ ). As a consequence, by varying the value of  $v$ , we get  $\delta_v = \delta(v)$  and  $f_v(x) = f(x, v)$ . Recall however that  $u(x, v, t) = h(v, t)p(x, v)$ , with  $0 \leq h(v, t) \leq 1$  and  $p$  is an increasing function

of  $x$ . Then by identification we get  $h(v, t) = \delta(v)^t$  and  $f(x, v) = p(x, v)$ .  $u$  therefore adopts the typical form of an exponential discounted utility function,  $u(x, v, t) = \delta(v)^t p(x, v)$ .  $\square$

## Acknowledgments

We are indebted to the participants of the session on Eighteenth Century Analysis, organized within the 20th Conference of the European Society for the History of Economic Thought (Paris, May 2016), where a previous version of this paper was discussed. We also thank Victor Bianchini, Laurie Bréban, Laurent Jaffro, Ecem Okan and Nathalie Sigot for their comments. Finally, comments and criticisms by the referees of this journal helped us to improve not only the paper in general, but also crucial argumentation. Nonetheless, the usual caveat remains.

## References

- Fuad Askerlov, Denis Bouyssou and Bernard Monjardet, 2007. *Utility Maximization, Choice and Preference* (2nd edition), Berlin, Heidelberg: Springer-Verlag.
- Annette C. Baier, 1991. *A Progress of Sentiments*, Cambridge (Mass.): Harvard University Press.
- Donald L.M. Baxter, 1988. Hume on Infinite Divisibility, *History of Philosophy Quarterly*, 5, pp. 133-40.
- Donald L.M. Baxter, 2001. Hume on Steadfast Objects and Time, *Hume Studies*, 27(1), pp. 129-48.
- Ken Binmore, 1994. *Game Theory and the Social Contract*, Vol 1: Playing Fair, Cambridge MA and London: MIT Press.
- Eugen von Böhm-Bawerk, 1889. *The Positive Theory of Capital*, edited by W.A. Smart, New-York: G.E. Stechert, 1930.
- Charlie D. Broad, 1961. Hume's Doctrine of Space, *Proceedings of the British Academy*, 47, pp. 161-76.
- Angela M. Coventry, 2010. Hume's System of Space and Time, *Logical Analysis and History of Philosophy*, 13, pp. 76-89.
- Rachel Cohon, 2008. *Hume's Morality - Feelings and Fabrication*, Oxford: Oxford University Press.
- Francis W. Dauer, 1999. Force and Vivacity in the *Treatise* and the *Enquiry*, *Hume Studies*, 25(1/2), April and November, pp. 83-99.
- Gordon F. Davis, 2003. Philosophical Psychology and Economic Psychology in David Hume and Adam Smith, *History of Political Economy*, 35(2), Summer, pp. 269-304.
- Marc-Arthur Diaye and André Lapidus, 2005a. A Humean Theory of Choice of which Rationality May Be one Consequence, *European Journal of the History of Economic Thought*, 12(1), March, pp. 89-111.

Marc-Arthur Diaye and André Lapidus, 2005b. Why Rationality May Be a Consequence of Hume's Theory of Choice, *European Journal of the History of Economic Thought*, 12(1), March, pp. 119-26.

Marc-Arthur Diaye and André Lapidus, 2012. Pleasure and Belief in Hume's Decision Process, *European Journal of the History of Economic Thought*, 19(3), June, pp. 355-34.

Jon Elster, 1977. Ulysses and the Sirens: A Theory of Imperfect Rationality, *Social Science Information*, 16(5), August, pp. 469-526.

Lorne Falkenstein, 1997. Hume on Manners of Disposition and the Ideas of Space and Time, *Archiv für Geschichte der Philosophie*, 79, pp. 179-201.

Peter C. Fishburn and Ariel Rubinstein, 1982. Time Preference, *International Economic Review*, 23(3), October, pp. 677-94.

Antony Flew, 1976. Infinite Divisibility in Hume's *Treatise*, in D. W. Livingston and J. T. King (eds), *Hume: A Re-evaluation*, New York: Fordham University Press, pp. 257-69).

Knud Haakonssen, 2009. The Structure of Hume's Political Theory, in D.F. Norton and J. Taylor (eds), *The Cambridge Companion to Hume*, New York: Cambridge University Press, pp. 341-80.

Russel Hardin, 2007. *David Hume: Moral and Political Theorist*, Oxford/New-York: Oxford University Press.

David Hume, 1739-1740. *A Treatise of Human Nature*, edited by D.F. Norton and M.J. Norton, Oxford: Oxford University Press, 2002.

David Hume, 1748. *Enquiry Concerning Human Understanding*, edited by T.L. Beauchamp, Oxford: Oxford University Press, 1999.

David Hume, 1751. *Enquiry Concerning the Principles of Morals*, edited by T.L. Beauchamp, Oxford: Oxford University Press, 1998.

David Hume, 1757. *A Dissertation on the Passions*, in David Hume, *A Dissertation on the Passions; The Natural History of Religion*, edited by T.L. Beauchamp, Oxford: Oxford University Press, 2007.

David Hume, 1777. *Essays Political, Moral, and Literary*, edited by E.F. Miller, Indianapolis: Liberty Classics, 1987.

John Immerwahr, 1992. Hume on Tranquillizing the Passions, *Hume Studies*, 18(2), November, pp. 293-314.

Dale Jacquette, 2001. *David Hume's Critique of Infinity*, Leiden, Boston, Köln: Brill.

Oliver A. Johnson, 1989. Time and the Idea of Time, *Hume Studies*, 15(1), April, pp. 205-19.

Norman Kemp Smith, 1941. *The Philosophy of David Hume – A Critical Study of its Origins and Central Doctrines*, New-York: Palgrave, 2005.

Tjalling C. Koopmans, 1960. Stationary Ordinal Utility and Impatience, *Econometrica*, 28(2), April, pp. 287-309.

- André Lapidus, 2000. La Rationalité du Choix passionnel : En Quête de l'Héritage de David Hume, *L'Année sociologique*, 50(1), pp. 9-84.
- André Lapidus, 2010. The Valuation of Decision and Individual Welfare. A Humean Approach, *European Journal of the History of Economic Thought*, February, 17(1), pp. 1-28.
- André Lapidus, 2011. The Possibility of a Welfare Policy in a World of Emotion-Driven Individuals: A Humean Point of View, in R. Ege and H. Igersheim (eds), *Freedom and Happiness in Economics and Philosophy*, London: Routledge, pp. 212-28.
- André Lapidus, 2018. David Hume and Rationality in Decision-Making: A Case Study on the Economic Reading of a Philosopher, in R. Ege and H. Igersheim (eds), *The Individual and the Other in Economic Thought*, London: Routledge, pp. 270-90
- John L. Mackie, 1980. *Hume's Moral Theory*, London: Routledge.
- John D. Norton, 2010. How Hume and Mach Helped Einstein to Find Special Relativity, in M. Domski and M. Dickson (eds), *Discourse on a New Method. Reinvigorating the Marriage of History and Philosophy of Science*, Chicago: Open Court, pp. 359-87.
- Ecem Okan, 2018. *Between History and Analysis: Progress According to David Hume and Adam Smith*, PhD Dissertation, Paris: University Paris 1 Panthéon-Sorbonne.
- Ignacio Palacios-Huerta, 2003. Time-Inconsistent Preferences in Adam Smith and David Hume, *History of Political Economy*, 35(2), Summer, pp. 241-68.
- Derek Parfit, 1971. Personal Identity, *Philosophical Review*, 80(1), January, pp. 3-27.
- Sandra Peart, 2000. Irrationality and Intertemporal Choice in Early Neoclassical Thought, *Canadian Journal of Economics*, 33(1), February, pp. 175-89.
- John Rawls, 1971. *A Theory of Justice* [revised edition, 1999], Cambridge: Harvard University Press.
- Matias Slavov, 2016. Empiricism and Relationism Intertwined: Hume and Einstein's Special Theory of Relativity, *Theoria* 31(2), pp. 247-63.
- John Stachel, 2002. *Einstein from 'B' to 'Z'*. Boston: Birkhäuser.
- Robert H. Strotz, 1956. Myopia and Inconsistency in Dynamic Utility Maximization, *Review of Economic Studies*, 23(3), June, pp. 165-80.
- Richard Sturn, 2004. The Sceptic as an Economist's Philosopher? Humean Utility as a Positive Principle, *European Journal of the History of Economic Thought*, 11(3), Autumn, pp. 345-75.