**Differentiate the paragraphs of the** **Introduction and Conclusion, and then arrange them in the correct order.**

*Different Modes of Discounting in Repeated Games*

*Introduction:*

**10**

Repeated games have become a centerpiece in economic theory, describing repeated interactions among strategically thinking individuals. In most studies involving repeated games, two assumptions are made.

**5**

The first is that players discount geometrically. Geometric discounting is one of the simplest and most mathematically rich modes of discounting. However, research suggests that humans discount hyperbolically (see [Ainslie](#_bookmark32) [(1992)),](#_bookmark32) assigning more weight to pay-offs that occur closer to the present, a phenomenon known as “present bias”.

**7**

The second assumption commonly made in game-theoretic literature is that players use identical discount factors. While valid for certain settings, this assumption is by no means universally appropriate, and in fact it hides a time-dynamic aspect of the more general case.

**2**

When players have different discount factors, the possibility of intertemporal trade becomes available. In particular, a relatively patient player can agree to grant a relatively impatient player higher rewards in earlier periods (which the impatient player weights more heavily) in exchange for higher rewards to the patient player in later periods (which the patient player weights more heavily). Such intertemporal trade can yield discounted total payoffs for the repeated game that lie outside the set of feasible rewards of the stage game.

**1**

With hyperbolic discounting another novel aspect arises, namely, time inconsistency of players’ planned actions. A player exhibiting present bias may plan to follow one strategy to maximize its total repeated-game payoff; but because of its present bias, when it actually finds itself in later periods, it may prefer to play a different strategy.

**6**

This paper is organized as follows. We start by detailing the model we will use in our study. In section [3](#_bookmark1), we then analyze the model under geometric discounting, first laying out the well-studied baseline case of identical discount factors before moving to the case of different discount factors.

**3**

Next, in section [4](#_bookmark20) we turn to hyperbolic discounting, again looking at the cases of identical and different discount factors. In section [5](#_bookmark31), we summarize our discussion and give some concluding remarks.

*Conclusion:*

**4**

This paper represents a first exploration into the theory of repeated games. After defining some general concepts in repeated games, we considered geometric discounting, presenting celebrated results for the cases of identical and different discount factors.

**12**

For the prisoner’s dilemma in which players have the same quasi-hyperbolic discount factors, we showed that the mutually cooperative payoff profile (1, 1) is sustainable as a subgame-perfect Nash equilibrium under the analogous condition as for identical geometric discount factors.

**8**

We then constructed an explicit equilibrium to the infinitely repeated two-player prisoner’s dilemma that allows us to get arbitrarily close to the Pareto optimal payoff profile (2*,* 3 ). We next turned our attention to quasi-hyperbolic discounting.

**9**

We then showed that, when player 1 discounts quasi- hyperbolically and player 2 geometrically, we can get again arbitrarily close to the payoff profile (2, 3) by choosing suitable discount factors.

**11**

This paper gives many directions for future research. Under geometric discounting with different discount factors, the payoff profile (2, 3) lies on the Pareto frontier; the reward stream to each player is monotonic, and therefore individual rationality puts a lower bound of 0 on any reward received by the relatively impatient player in the second phase. We need to determine whether this point is on the Pareto frontier in the case of quasi-hyperbolic discounting as well, or if there is a feasible and individually rational payoff profile that Pareto dominates it.

**14**

The main contribution of this paper is to show explicit constructions of payoffs arbitrarily close to a given point.

**13**

Really what we would like to do is characterize the feasible and individually rational payoff sets, `a la [Lehrer and Pauzner (1999).](#_bookmark37) It is this problem that calls out most loudly for future attention.