

**UNDERGRADUATE THESIS**

**ASYMMETRY IN VALUE OF TIME SAVINGS AND  
LOSSES OF AUTOMOBILE USERS' IN JAKARTA**



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(Accredited by SK BAN-PT Number: 11370/SK/BAN-PT/AK-ISK/S/X/2021)  
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## STATEMENT OF ORIGINALITY

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Jakarta, 13<sup>th</sup> January 2022



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# **ASIMETRI PENGHEMATAN DAN PENAMBAHAN NILAI WAKTU PENGGUNA MOBIL DI JAKARTA**

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## **ABSTRAK**

Nilai waktu merupakan salah satu parameter utama dalam menentukan kelayakan investasi dan pengambilan kebijakan dalam transportasi. Sayangnya studi mengenai nilai waktu belum banyak dilakukan di Indonesia padahal penentuan nilai waktu ini seringkali menjadi sangat subjektif karena banyak cara dapat digunakan untuk menentukannya. Dalam studi ini akan dicari besar asimetri dalam nilai waktu pengguna mobil di DKI Jakarta terkait penambahan dan pengurangan waktu perjalanan dan perjalanan dengan tujuan wisata dan bisnis. Pengumpulan data dalam studi ini dilakukan secara daring, data dianalisis menggunakan salah satu model keputusan diskret yaitu model multinomial logit. Hasil studi menunjukkan bahwa terdapat asimetri dalam nilai waktu. Perbandingan nilai waktu untuk perjalanan wisata dan bisnis adalah 1:1.5. Asimetri nilai waktu terkait penambahan dan pengurangan waktu untuk perjalanan wisata ditemukan sebesar 1:3.5 dan untuk perjalanan bisnis sebesar 8:1.

Kata Kunci: Nilai waktu, Asimetri Nilai Waktu, Ekonomi Transportasi, Teori Prospek

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## **ABSTRACT**

The value of time is one of the most used parameters in transportation investment decision-making as well as transportation-related policies. Unfortunately, the value of time is not much yet studied in Indonesia, whereas there are a lot of ways to decide the value of time, making it highly subjective. The objective of this study is to find the value of the asymmetry in the value of time for automobile users' in Jakarta especially related to gains and losses to travel time and leisure and business trip purposes. The data in this study was gathered using an online survey and the analysis was done using multinomial logit model, a branch in the family of discrete choice models. This study has found that there exists an asymmetry in the value of time, with the ratio for leisure and business trips being 1:1.5. The asymmetry concerning travel time gains and losses for leisure trips was found to be 1:3.5 and for business trips as much as 8:1.

**Keywords:** Transportation Economics, Prospect Theory, Value of Time, Asymmetry in the Value of Time

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## NOMENCLATURE

$AR$	: Alternate Road
$APS$	: Attribute Processing Strategies
$ASC$	: Associated Specific Constant
$COS$	: Toll Cost
$FFT$	: Free-flow time
$IDE$	: Integrated Development Environment
$MNL$	: Multinomial logit
$MR$	: Main Road/Referred Road
$MRS$	: Marginal Rate of Substitution
$MLE$	: Maximum Likelihood Estimation
$RP$	: Revealed Preference
$SDT$	: Slowed Down time
$SP$	: Stated Preference
$VAR$	: Variability
$VOT$	: Value of Time/Value of Travel Time
$VOTS$	: Value of Time Savings
$\beta_{COS}$	: Parameter associated with toll cost
$\beta_{COS(inc)}$	: Parameter associated with increasing toll cost
$\beta_{COS(dec)}$	: Parameter associated with decreasing toll cost
$\beta_{FFT}$	: Parameter associated with free-flow time
$\beta_{SDT}$	: Parameter associated with slowed-down time
$\beta_{TT}$	: Parameter associated with total travel time
$\beta_{TT(inc)}$	: Parameter associated with increasing total travel time
$\beta_{TT(dec)}$	: Parameter associated with decreasing total travel time
$\beta_{VAR}$	: Parameter associated with variability
$\delta_{AR}$	: Associated Specific Constant related to alternate road A/B

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# CHAPTER 1

## INTRODUCTION

### 1.1 Background Introduction

Value of travel time or simply the value of time is ubiquitous as it is widely used in generating travel demand models, transportation policies, as well as investment decisions (Button, 2007). Travel demand models typically find that travel time is the most explanatory variable in terms of statistical and economical significance, exceeding cost (Small, 2012). The main aim in transportation investments and policies is to reduce travel time, and to increase its reliability (Button, 2007). Thus, the study of the value of time is an integral part of transportation studies.

In its early years, the value of time is assumed to be equal to wage per hour (Becker, 1965), and in 1971, DeSerpa proposed the value of time to be the solution to a Lagrangian function. The idea is that the individual will be subject to a budget constraint, and by maximizing the utility curve, the value of time could then be found. This idea aligns with the consumer utility theory, which states that consumers will spend their resources in a way that maximizes utility, which includes resources used in travel decisions. In toll road market survey, the value of time is usually taken as toll cost per time savings compared to free roads. (Stockton and Kang, 2008).

In reality, the value of time depends on its circumstances. Automobile drivers value time more highly under congested conditions than under free-flow conditions, by 25% to 55%. (Abrantes and Wardman, 2011) Values of time for business travel are found to be the highest and for leisure travel the lowest. (Shires and de Jong, 2009) Other heterogeneities such as Income, distance, cost, may also play a part as the source of variation in the value of time. The value of time also depends on its status quo or reference point. (Fosgerau, 2007) Asymmetries in form of distinction between willingness to pay (WTP) and willingness to accept (WTA) are also well known to exist. (Hess, Rose, and Hensher, 2008) This phenomenon is

explained by prospect theory, which states that compared to gains, losses create larger emotional impacts, or in other words, people are loss averse. (Kahneman and Tversky, 1979) Therefore, the actual value of time could not be a constant, but rather a function.

There are a lot of heterogeneities to the value of time. The present research focuses on the effect of change in the status quo in form of gains and losses to automobile users' value of time. The main objective being to figure out the existence of asymmetry and to find the ratio of WTP to WTA which could be used as a general rule of thumb in policymaking.

## **1.2 Research Question**

1. Is there an asymmetry in automobile users perceived value of time savings and losses?
2. How sensitive are automobile users value of time savings and losses?

## **1.3 Thesis Objective**

1. To Evaluate whether there is an asymmetry in automobile users' value of time.
2. To Evaluate the sensitivity of automobile users' value of time savings and losses.

## **1.4 Scope of Research**

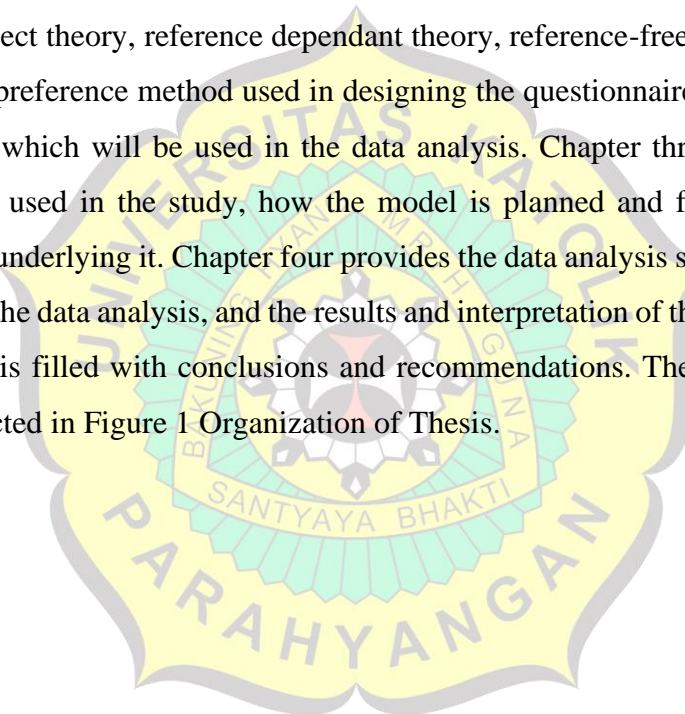
As the objective of this research is simply to find out automobile users' asymmetry of the value of time, the independent variable of this study is cost, and the control variable will be time. Other variables can be distinguished as intrinsic variables (inherent to each person) such as income, occupation, gender, number of children, and extrinsic variables such as urgency or trip type, distance, congestion. The challenge of this study is to find the most neutral, plain value of time. In order to do this, extrinsic variables will be normalized by the design of the SP survey.



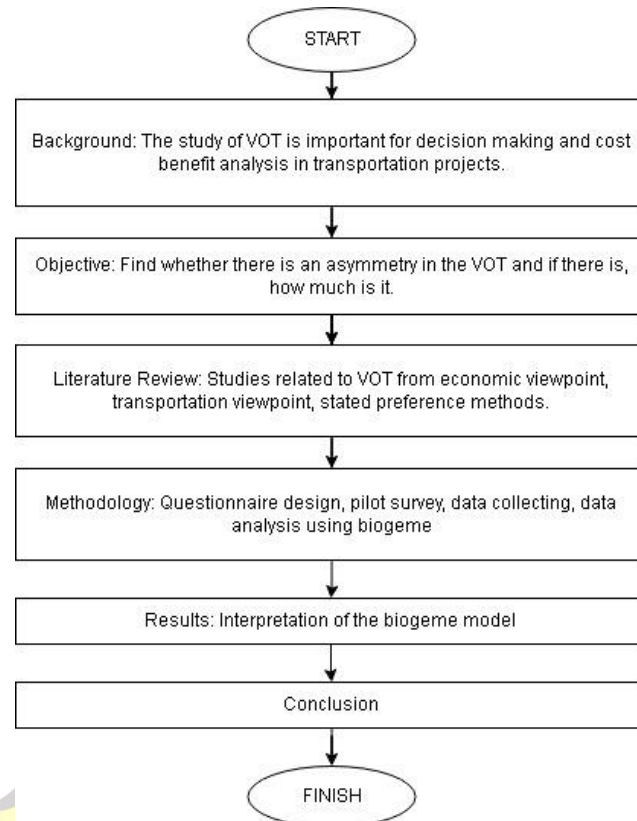
Intrinsic variables however are unable to be normalized and will stay as a variable in this study.

## **1.5 Thesis Organization**

Chapter one explains the background of the study, why the value of time is of utmost importance in transportation studies, briefly explains why the value of time is supposed to be a function, and that the objective of the study is to find the asymmetry in the value of time savings and losses or in other words, the WTP and WTA. Chapter two explains the theories underlying the study of the value of time, such as prospect theory, reference dependant theory, reference-free theory, as well as the stated preference method used in designing the questionnaire, as well as the MNL model which will be used in the data analysis. Chapter three explains the methodology used in the study, how the model is planned and formed, and the assumptions underlying it. Chapter four provides the data analysis step-by-step, the code used in the data analysis, and the results and interpretation of the data analysis. Chapter five is filled with conclusions and recommendations. The outline of this study is depicted in Figure 1 Organization of Thesis.







**Figure 1** Organization of Thesis

Much of the method presented in this study refers to a paper by Hess, Rose, and Hensher (2008) titled Asymmetrical Preference Formation in Willingness to Pay Estimates in Discrete Choice Models. The comparison of both study is presented in Table 1 Comparison of the referred Paper and this Thesis.

**Table 1** Comparison of the referred Paper and this Thesis

<b>Asymmetrical WTP in Discrete Choice Methods (Hess and Hensher, 2012)</b>	<b>Asymmetry in VOTS and Losses of Automobile Users' in Jakarta</b>
Data collected in Sydney, 2004	Data collected in Jakarta, 2021
Uses D-efficient design for the design of experiment	Uses Taguchi's Orthogonal Array for the design of the experiment
Uses SP and RP data, collects the most recent trip data from various respondents	Uses purely SP data
Various trip types are used, albeit a fraction of each	Uses two hypothetical situations, a leisure trip, and a business trip