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Development programs for one-shot systems using multiple-state design reliability models

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Development Programs for One-Shot Systems Using Multiple-State Design Reliability Models

by

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ABSTRACT

Development Programs for One-Shot Systems Using Multiple-State Design Reliability Models

Design reliability at the beginning of a product development program is typically low and development costs account for a large proportion of the total product cost. Our research focuses on how to conduct "development programs" (series of tests and redesigns) to both achieve high final design reliability and spend as little of a fixed budget as possible on development. Multiple-state reliability models are used. We consider one-shot systems, which are destroyed at first use or during testing. Dynamic programming is used to identify the best test-and-redesign strategy and is shown to presently be computationally feasible for at least 5 state models. Our analysis is flexible enough to allow for accelerated testing in the case of ultra-high reliability requirements, where testing otherwise provides little information on design reliability growth.

CHAPTER1. INTRODUCTION

Under global competition, industries have been forced to reconsider how products are designed and developed. High quality and inexpensive products requiring shorter product development cycles, and using fewer resources, are desired. Reliability is often one of the most important considerations, and is of especially high concern for systems that produce risk to human life or affect the security of countries. Reliability is the probability that a system performs its intended functions for a given period of time under the conditions of intended customer use [Martz and Waller, 1982]. Different devices have different definitions of acceptable performance. In order to compete in their business sectors, managements need to adopt meaningful definitions of reliability for their own systems.

At the beginning of a product development process, product reliability is typically low. Therefore, reliability typically needs to be improved through development activities. To achieve this, a well-planned design reliability growth program needs to be established. The purpose of a reliability growth program is to increase confidence that the final product will meet the user 's expectations. Commonly, such programs involve two core activities: testing and redesign. These activities are typically carried out repetitively in the development process until a target reliability is reached. Testing is used to confirm the effectiveness of systems of a current design and track the growth of reliability. Information gained from testing is incorporated, analyzed, and utilized in order to help developers choose the right corrective actions to counter failures and to improve system design reliability. Unfortunately, testing is not free but uses up some resources. This is especially true of testing processes for complex or large defense systems. For example, testing for missile systems consumes much time and resources for planning, designing, developing, operating, and evaluating tests [Gehrig, 1992]. To operate efficiently, only necessary tests should be performed. Developers must figure out how much testing is enough, when testing should be ordered, and how much of a budget must be spent on testing, in order to obtain adequate and meaningful information. If one stops testing too soon, important failure modes may not be found and fixed. If one performs unnecessary tests, the product development cycle will be lengthened unnecessarily and resources wasted.

1.1 Statement of Problem

Our research was originally inspired by Seglie [1992] who raised the question "How much testing is enough?" in the context of military procurement. Most reliability growth models used in military procurement are based on sampling theory (or standard tables), and have been found to be less than satisfactory in practice. Typically, fixed sample sizes have been used for test planning because they are operationally and theoretically simple. Once the amount of testing required to assure a certain level of reliability is determined by the developers at the beginning of a development process, this number is not adjusted even if it proves to be too big or too small at some point during development. Very small sample sizes result in either very low levels of confidence in reliability estimates or in imprecise estimates. An unnecessarily large sample size results in over-testing, which increases development time and costs. We wish to develop a reliability growth analysis that can prescribe when testing and redesign should be ordered and when a development process should be terminated.

Existing reliability models rarely link design reliability improvement directly to development activities. Most standard analyses also adopt high final reliability as the primary goal and ignore development cost. But development costs account for a large proportion of total product cost, especially for one-shot military systems (which are destroyed with their first use or test). We seek to produce a reliability growth analysis that takes into account these issues and yields effective prescriptions for development programs for one-shot systems.

1.2 Research Objectives and Benefits

The purpose of this research is to determine an optimal development plan, which provides a strategy of tests and redesigns, with the goal of achieving high final design reliability while spending as little of a fixed budget as possible. Our research considers one-shot systems and uses a multiple-state reliability model. The bigger the number of design reliability states, the better one expects to be able to describe reliability growth. (On the other hand, computational difficulty also increases with the number of states.)

We assume an initial budget is sufficient to build n systems of an initial design. The development program proceeds in stages. At each stage, a development policy prescribes "*build,*" "*test,*" or "*redesign.*" Tests and redesigns are purchased at costs of t and d systems respectively. An optimal development plan prescribes a best development activity at each stage of the program in light of all that has gone before and the remaining budget. After development is terminated, the final design is applied to produce a stockpile whose size is determined by the remaining budget and whose expected number of good systems depends on the actual final design reliability.

Once the model and optimal plans are identified, we investigate how the growth of reliability is related to such factors as costs of redesign and testing, the initial probability distribution for the states, the design reliability vector, and the Markov chain transition matrix used to describe the effects of redesigns. Simulation experiments lead to a better understanding of the nature of optimal development plans.

Our research can be applied in development programs for military systems and in some in-house industrial contexts, when there is a fixed budget for development and production.

1.3 Method and Research Procedure

Our analysis is modified and extended from that of Moon, Vardeman, and McBeth [1999]. As in that paper, testing and redesigning are decoupled. Testing provides information about current design reliability by producing binary test results: successes or failures. Testing is sequential (tests are ordered one at a time with a per test cost of t systems lost to a final stockpile). Bayes' rule is used to incorporate test information and update probabilities of being at each design reliability state. Redesign is purchased at a cost of d systems lost to a final stockpile per unit of engineering effort expended in attempts to improve design reliability. Movements between design reliability states are modeled using a stationary Markov chain. No restrictions on the development sequence are imposed *a priori*, so multiple tests or redesigns can be performed consecutively.

The method adopted here for determining optimal development programs consists of two major steps. First a table is built, which contains optimal returns for all possible probability distributions over reliability states at each possible remaining budget point. Dynamic programming is used to evaluate these returns, working from the smallest to largest possible remaining budget point. Second, these optimal return functions can be consulted at any stage of a development program (specified by a remaining budget and a distribution over states) to identify an optimal current development activity.

In some optimization problems direct numerical algorithms can be used to determine optimal policies by actually generating all possible sequences of test outcomes and choices about tests and redesigns. However, this method is not practical for any but the smallest instances of the problems we consider, since the number of possible sequences grows exponentially with the size of the budget. Our method for finding optimal policies is not complicated and provides solutions within a reasonable amount of computing time. Moreover, using this method can save much calculation time for determining optimal development plans at different initial probability distributions over reliability states, $\underline{s}_0$, since we do not need to repeat the first step as $\underline{s}_0$ changes.

We studied the behavior of optimal plans using stochastic simulation. This requires simulating test results and the effects of redesigns. The simulation process starts at an initial budget of *n* systems and a starting probability distribution over reliability states and terminates when the action "*build*" is chosen. During the simulation process, an optimal activity at any stage is identified using the stored table of optimal returns.

In our simulation studies, we studied 7,128 cases for a 3-state reliability model. These were built from 9 combinations of test and redesign costs, 3 sets of design reliability vectors, 2 "non-regressive" transition matrices and 2 redesign transition matrices allowing the possibility of design degradation, and 66 sets of initial probability vectors for the 3 reliability states. We also studied 8,316 additional cases for a generalization of the 3-state reliability model allowing accelerated testing for high reliability systems. These were built from 6 combinations of test and redesign costs, 2 sets of high design reliability vectors, 1 non-regressive and 2 other redesign transition matrices, and 66 sets of initial probability vectors for 3 reliability states.

1.4 Summary of Subsequent Chapters

This dissertation is organized as follows. A review of existing literature is given in the Chapter 2. Chapter 3 discusses our model and analysis for multiple-state reliability. Chapter 4 contains analyses of the behavior of optimal policies and discussions. Chapter 5 presents a modification of the basic model allowing accelerated testing for high design reliability systems and analyses of the behavior of optimal policies in this generalization of the basic model. Finally, conclusions and further research directions are described in Chapter 6.

CHAPTER 2. LITERATURE REVIEW

Reliability is of concern early in a product design process, because it typically needs improvement. Initial design reliability can be as low as 15% of the mature reliability [Crow and Heitman, 1997]. Today's products are often sophisticated, complex and expensive, and we therefore need to identify effective development programs that can bring mature products to market faster, with less development cost. The reliability growth concept is one of the most important ideas that can be applied to help achieve those goals. It provides substantial benefits for (1) planning a reliability program, (2) monitoring progress and estimating current reliability, and (3) predicting future reliability improvement [O'Connor, 1995 and Meth, 1992].

Over the years, a number of reliability growth models have been developed. These can be characterized as discrete or continuous, based on the kind of test data observed [Fries and Sen, 1996]. Discrete models describe improvement in the "*probability of success*" as a function of test trials. Continuous models describe improvement in the "*failure rate*" or mean time between failures as a function of test trials. The earliest reliability growth model was developed by Duane [1964]. He developed an empirical model based on mean-time-to-failure information on aircraft and plotted learning curves to monitor the rate of improvement. More reliability growth models are listed in The Military Handbook on Reliability Growth Management [MIL-HDBK-189, 1981], which can be used as a guideline for choosing a model for a particular application.

Some researchers have developed Bayesian reliability growth models. Bayesian reliability growth theory is flexible and cost-effective because it requires smaller sample sizes to achieve the same quality of inference as methods based purely on sampling data under time and cost constraints [Martz and Waller, 1982]. However, Bayesian models require the use of prior information, which some criticize as being subjective and not easy to make quantitative and explicit. The following are examples of discrete, continuous, and nonparametric Bayesian reliability growth analyses: Pollock [1968], Fard and Dietrich [1987], Mazzuchi, and Soyer [1991,1993], Erkanli, Mazzuchi, and Soyer [1998], Robinson and Dietrich [1987,1989], Calabria, Guida, and Pulcini[1996], and Fries and Sen [1996].

Generally, reliability programs involve two activities: test and redesign. These are performed in stages and with the intention of improving system reliability. However, only a few researchers have developed models in which reliability growth is directly linked to development activities. Lloyd and Lipow [1977] proposed an exponential reliability growth model for a series of test-trials. Each trial consisted of single test. The model assumed that a system had only one failure mode and there were 2 reliability states: unreliable or completely reliable. The failure probability for the best state was zero and for bad state was greater than zero. A test result was a success or a failure. When a test was failed, redesign was ordered and this activity fixed the defect with a (constant) probability less than 1. Once a redesign successfully removed the defect, it remained permanently absent. This model is the earliest model that provides any insight into how development activities affect reliability. However, this model solely emphasizes high reliability and ignores development cost.

The following authors combine high reliability and small development cost into a single objective by aiming to spend as little of a budget on development as possible, while still achieving high design reliability. Gaver and Jacobs [1997] identified numbers of items for destructive testing with the objective of optimizing the number of effective remaining items. They assumed that a system was destroyed in testing and if the system failed, one single root-cause fault was found and removed successfully from all remaining systems. Huang, McBeth, and Vardeman [1996] developed test programs for one-shot systems with the objective of maximizing the mean number of effective systems in a final stockpile. They used a 2-state reliability model. Testing produced binary results with the cost of a single system lost to a final stockpile. Redesign was ordered only after a failed test and was free. Four stopping rules were developed (including an optimal method derived from dynamic programming) and compared for their effectiveness. The Gaver and Jacobs and Huang, McBeth, and Vardeman analyses are easy to implement. But the models use some potentially unrealistic assumptions. These are: 1) the cost of a test is one system 2) redesign is done only when a test is failed, 3) redesign costs are ignored, and 4) redesign can only improve system reliability.

Moon, Vardeman, and McBeth [1999] improved the Huang, McBeth, and Vardeman 2-state analysis. Among the improvements they made were: 1) testing and redesign were decoupled, 2) redesign was allowed to potentially degrade design reliability, and 3) a redesign cost of d systems and a test cost of t (possibly different from 1) systems were incorporated. The two reliability states $j = 1, 2$ and have failure probabilities p_j. Assume $p_1 > p_2$ so state 1 represents a poor state and state 2 represents a good state. A test with a cost of t systems provides information about the current design reliability. The probability of being in the good state, s, is updated using Bayes' rule based on test results. An updated version of s is

$$s' = \eta_0(s) \equiv \frac{s \cdot p_2}{(1-s)\cdot(1-p_1)+s\cdot(1-p_2)}, \qquad \text{if a test is passed, } X = 0,$$

or

$$s' = \eta_1(s) \equiv \frac{s \cdot p_2}{(1-s)\cdot p_1 + s \cdot p_2}, \qquad \text{if a test is failed, } X = 1.$$

Redesign has the potential to change design reliability and movements between states are governed by transition matrix $\underline{u}$ as illustrated in Figure 2.1.

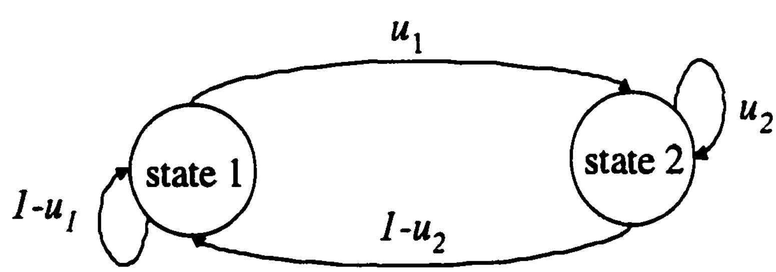

Figure 2.1: Possible Design Reliability Movements with Redesign

After a redesign, the reliability could be in either state 1 or state 2, so the formula for updating s based on a redesign is

$$s' = \delta(s) \equiv (1-s)\cdot u_1 + s \cdot u_2 \qquad (2.1)$$

$V_n(s)$ will stand for the optimal mean number of effective systems built at the end of development, given an initial budget of n, and provided the initial probability of being in the good state is $s = s_0$. The development activity appropriate at any stage of an optimal development program can be identified by choosing the maximum of conditional expected payoffs of testing, redesigning, and building. That is

$$V_n(s) = \max\ \{\Psi_1, \Psi_2, \Psi_3\} \tag{2.2}$$

for

$$\Psi_1 = \lfloor n \rfloor \cdot r(s),$$

$$\Psi_2 = r(s) \cdot V_{n-t}(\eta_0(s) + (1 - r(s)) \cdot V_{n-t}(\eta_1(s)),$$

$$\Psi_3 = V_{n-d}(\delta(s)).$$

"***Build,***" "***test,***" and "***redesign***" are then optimal activities with remaining budget n depending upon whether respectively $V_n(s) = \Psi_1$, $V_n(s) = \Psi_2$ or $V_n(s) = \Psi_3$.

The following are results from the analysis of Moon, Vardeman and McBeth [1999].

a) If $1 < n < \min(t, d)$, "***build***" is an optimal current activity.

b) If $n < t + d$, "***build***" is an optimal current activity.

c) If $n < 1 + t$, "***build***" and "***redesign***" are current potentially optimal activities.

d) If $n \geq \max(t, d)$, "***build,***" "***test,***" and "***redesign***" are current potentially optimal activities.

The Moon, Vardeman, and McBeth analysis is limited to a 2-state reliability model. We have extended their model and analysis to the case of multiple-state models and studied the behavior of optimal development programs for 15,444 combinations of model parameters under normal and accelerated testing conditions.

CHAPTER 3. MULTIPLE-STATE RELIABILITY MODELS

Notation

k number of design reliability states

C_{sys} cost of 1 system

n an initial budget for development program/C_{sys}

t cost of a test / C_{sys}

d cost of a system redesign/ C_{sys}

$\lfloor n \rfloor$ the largest integer not greater than n

$\underline{r}$ a design reliability vector for the states

$= (r_1, r_2, \ldots, r_k)$

$\underline{p}$ a design failure probability vector for the states

$= (p_1, p_2, \ldots, p_k)$ and $p_i = 1 - r_i$

$\underline{s}$ a probability distribution over the k reliability states

$= (s_1, s_2, \ldots, s_k)$

$\underline{s}_0$ an initial probability distribution over the k reliability states

$\underline{s}'$ the update of $\underline{s}$ after a redesign or a test

$\underline{\eta}_0(\underline{s})$ the update of $\underline{s}$ after a passed test

$\equiv (\eta_{01}(\underline{s}), \eta_{02}(\underline{s}), \ldots, \eta_{0k}(\underline{s}))$

$\underline{\eta}_1(\underline{s})$ the update of $\underline{s}$ after a failed test

$\equiv (\eta_{11}(\underline{s}), \eta_{12}(\underline{s}), \ldots, \eta_{1k}(\underline{s}))$

$\underline{\delta}(\underline{s})$ the update of $\underline{s}$ after a redesign

$\equiv (\delta_1(\underline{s}), \delta_2(\underline{s}), ..., \delta_k(\underline{s}))$

$\underline{\delta}^l(\underline{s})$ the update of $\underline{s}$ after l consecutive redesigns

$\underline{\beta}$ the steady-state probability vector for the states under an infinite series of redesigns

$\underline{u}$ a $k \times k$ Markov chain transition matrix describing the effects of redesigns

$$= \begin{pmatrix} u_{11} & u_{12} & \cdots & u_{1k} \\ u_{21} & u_{22} & \cdots & u_{2k} \\ \vdots & & & \vdots \\ u_{k1} & u_{k2} & \cdots & u_{kk} \end{pmatrix}$$

g a parameter used to construct the transition matrix $\underline{u}$ (a diagonal element representing a probability of staying at the same state)

f a parameter used to construct the transition matrix $\underline{u}$ (representing a conditional probability of improving design reliability given a change in reliability)

a a simplex-lattice parameter ($a+1$ equally spaced values from 0 to 1)

Π current design reliability

$= r_1$ or r_2 or ... r_k

$r(\underline{s})$ mean of Π or the expected reliability of a system of the current design

$V_n(\underline{s}_0)$ optimal expected number of effective systems built at the end of a development program, given an initial budget of n systems and starting probability distribution over the states $\underline{s}_0$

Ψ_1 optimal conditional expected number of effective systems in the final stockpile for a "***build next***" option

Ψ_2 optimal conditional expected number of effective systems in the final stockpile for a "*test next*" option

Ψ_3 optimal conditional expected number of effective systems in the final stockpile for a "*redesign next*" option

$\underline{s}^*$ probability distribution over the states at the end of a development program

$r(\underline{s}^*)$ expected (according to s^*) reliability at the end of a development program

$\lfloor B^* \rfloor$ a number of systems built

Π^* actual design reliability at the end of a development program

$= r_1$ or r_2 or... r_k

Assumptions

1) All costs are in units of systems built.

2) *n, t, d* are greater than 0 and can be integers or fractions.

3) An initial budget is sufficient to build *n* systems.

4) Testing does not change design reliability. It provides information on the current design reliability state. A test result is either a "success" or a "failure" and can be purchased at a cost of *t*.

5) Redesign has the potential to change the design reliability, but does not necessarily always improve it. It might degrade or improve design reliability, and can be purchased at a cost of *d*.

6) The effects of redesign are described by the redesign transition matrix $\underline{u}$.

7) Design reliability at a higher numbered state is greater than design reliability at a lower numbered state $(r_k > r_{k-1} > \ldots > r_1)$

8) There is no restriction on the order of activities in a development plan. Multiple redesigns can be performed in a row (in case the current design reliability is thought to be low or testing is expensive). Multiple tests can be performed in a row. Test information is Bernoulli distributed (and thus does not typically accumulate very fast).

3.1 Development Process

Our model is an extension of the Moon, Vardeman, and McBeth [1999] 2-state model to *k*-state reliability. We identify a development program that produces the largest mean number of effective systems of a final design, given an initial budget sufficient to build n systems. Conditional mean numbers of effective systems can be evaluated from the remaining budget at the end of development and the final design reliability. $E(\Pi^{*} \cdot \lfloor B^{*} \rfloor)$ is then the objective function used to measure the overall mean number of effective systems for a development plan. $V_n(\underline{s})$ is the maximum of this objective function, the overall return of an optimal development plan, given the initial budget of n systems and the starting probability distribution over the states $(\underline{s}_0 = \underline{s})$. A development process proceeds in stages. At any stage of a development program, there are 3 choices of development activity: "*test,*" "*redesign,*" and "*build.*" Each activity has a different conditional expected pay-off, which we proceed to explain in detail.

3.1.1 Testing

Testing provides information on the current design reliability state by producing a binary test result: a success or a failure on any test. Each test can be purchased at cost of t systems and a "sample size" of one is used for testing. Bayes' rule is used to update one's distribution for the current reliability state after a test is made. This, of course, requires knowledge of reliabilities of the states $(\underline{r})$, and a pre-test probability distribution over the states. $\underline{\eta}(s)$ is a vector specifying the updated probability distribution $(\underline{s}')$ after testing. The 2 possible versions of $\underline{\eta}(s)$ based on test results are $\underline{\eta}_0(\underline{s})$ (if a test is successful) and $\underline{\eta}_1(\underline{s})$ (if a test is a failure). The forms of $\underline{\eta}_0(\underline{s})$ and $\underline{\eta}_1(\underline{s})$ are generalizations of those obtained in the Huang, McBeth, and Vardeman [1996] 2-state analysis. That is,

let

$$r(\underline{s}) = r_1 \cdot s_1 + r_2 \cdot s_2 + \ldots + r_k \cdot s_k \tag{3.1}$$

$r(\underline{s})$ is the expected reliability of current design. Then the updated distribution over reliability states following a test is

$$\underline{s}' \equiv (\eta_{01}(\underline{s}), \eta_{02}(\underline{s}), \ldots, \eta_{0k}(\underline{s})), \qquad \text{if a test is successful, } X = 0$$

where

$$\eta_{0i}(\underline{s}) = \frac{s_i \cdot r_i}{r(\underline{s})} \qquad \text{for } i = 1, 2, \ldots, k \tag{3.2}$$

and

$$\underline{s}' \equiv (\eta_{11}(\underline{s}), \eta_{12}(\underline{s}), \ldots, \eta_{1k}(\underline{s})), \qquad \text{if a test is a failure, } X = 1$$

where

$$\eta_{1i}(\underline{s}) = \frac{s_i \cdot (1 - r_i)}{1 - r(\underline{s})} \qquad \text{for } i = 1, 2, \ldots, k \tag{3.3}$$

The remaining budget after testing will be $n - t$, therefore the optimal conditional expected numbers of effective systems will be $V_{n-t}(\underline{\eta}_0(\underline{s}))$ (if a test is successful) or $V_{n-t}(\underline{\eta}_1(\underline{s}))$ (if a test is a failure). So the expected final return after testing is

$$r(\underline{s}) \cdot V_{n-t}(\underline{\eta}_0(\underline{s})) + (1 - r(\underline{s})) \cdot V_{n-t}(\underline{\eta}_1(\underline{s})).$$

3.1.2 Redesign

Redesign at a cost of d systems has the potential to improve current design reliability. Our model allows the possibility of regressive redesigns (degrading design reliability). The effect of redesign is represented by a transition matrix $\underline{u}$ describing movements between design reliability states (to better or lower states) as shown in Figure 3.1.

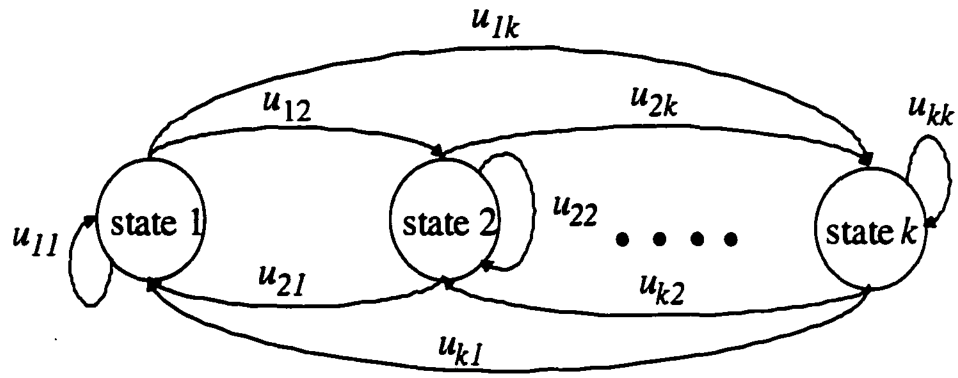

Figure 3.1: Possible Design Reliability Movements with Redesign for *k*-State Model

Let $\underline{\delta}(\underline{s})$ be an updated probability distribution over the states $(\underline{s}')$ produced by redesign. The form of this is a generalization of the form from the Moon, McBeth, and Vardeman 2-state analysis. Each

$$\delta_i(\underline{s}) = s_1 \cdot u_{1i} + s_2 \cdot u_{2i} + \ldots + s_k \cdot u_{ki} \qquad \text{for } i = 1, 2, \ldots, k,$$

or in matrix notation

$$\underline{s}' \equiv (\delta_1(\underline{s}), \delta_2(\underline{s}), \ldots, \delta_k(\underline{s})) = (s_1, s_2, \ldots, s_k) \cdot \begin{pmatrix} u_{11} & u_{12} & \cdots & u_{1k} \\ u_{21} & u_{22} & \cdots & u_{2k} \\ \vdots & & & \vdots \\ u_{k1} & u_{k2} & \cdots & u_{kk} \end{pmatrix} \tag{3.4}$$

The remaining budget after redesign will be $n - d$. Therefore the optimal expected return after redesign is $V_{n-d}(\underline{\delta}(\underline{s}))$.

3.1.3 Build

The final potential development activity is "*build*" which means that the development program is terminated and the entire remaining budget is used to build systems according to the current design and with its reliability. Therefore if one builds, the mean number of effective systems in the final stockpile is $\lfloor n \rfloor \cdot r(\underline{s})$.

3.1.4 Optimal Return Function

In light of the forgoing development, the overall optimal return function is

$$V_n(\underline{s}) = \max\{\Psi_1, \Psi_2, \Psi_3\} \tag{3.5}$$

for

$$\Psi_1 = \lfloor n \rfloor \cdot r(\underline{s}),$$

$$\Psi_2 = r(\underline{s}) \cdot V_{n-t}(\underline{\eta}_0(\underline{s})) + (1 - r(\underline{s})) \cdot V_{n-t}(\underline{\eta}_1(\underline{s})),$$

and

$$\Psi_3 = V_{n-d}(\underline{\delta}(\underline{s})),$$

and a development activity is (currently or initially) optimal at budget n and distribution $\underline{s}$ if its corresponding Ψ is maximum.

Optimal activities at any stage of a development program can be determined by repeatedly updating the remaining budget and probability distribution over the states and using the recursive form of equation (3.5). For example if "*redesign*" is an optimal activity for the "*first*" stage, the remaining budget (n') and the updated probability distribution ($\underline{s}'$) after redesign are $n-d$ and $\underline{\delta}(\underline{s})$ respectively. The equation for determining the optimal next activity is

$$V_{n-d}(\underline{\delta}(\underline{s})) = \max\{\Psi_1, \Psi_2, \Psi_3\}$$

for

$$\Psi_1 = \lfloor n-d \rfloor \cdot r(\underline{\delta}(\underline{s})),$$

$$\Psi_2 = r(\underline{\delta}(\underline{s})) \cdot V_{n-d-t}(\underline{\eta}_0(\underline{\delta}(\underline{s}))) + (1 - r(\underline{\delta}(\underline{s}))) \cdot V_{n-d-t}(\underline{\eta}_1(\underline{\delta}(\underline{s}))),$$

and

$$\Psi_3 = V_{n-d-d}(\underline{\delta}(\underline{\delta}(\underline{s}))),$$

where an optimal "*second*" activity corresponds to a maximal Ψ.

If "*test*" is the optimal activity for the "*first*" stage, the remaining budget after testing is $n-t$ and the updated probability distribution $(\underline{s}')$ could be $\underline{\eta}_0(\underline{s})$ or $\underline{\eta}_1(\underline{s})$. The equation for determining the next optimal activity is

$$V_{n-t}(\underline{\eta}_0(\underline{s})) = \max\{\Psi_1, \Psi_2, \Psi_3\}, \text{ if the test at the first stage is "\textit{successful},"}$$

where

$$\Psi_1 = \lfloor n-t \rfloor \cdot r(\underline{\eta}_0(\underline{s})),$$

$$\Psi_2 = r(\underline{\eta}_0(\underline{s}))\cdot V_{n-t-t}(\underline{\eta}_0(\underline{\eta}_0(\underline{s}))) + (1-r(\underline{\eta}_0(\underline{s})))\cdot V_{n-t-t}(\underline{\eta}_1(\underline{\eta}_0(\underline{s}))),$$

and

$$\Psi_3 = V_{n-t-d}(\underline{\delta}(\underline{\eta}_0(\underline{s}))),$$

or

$$V_{n-t}(\underline{\eta}_1(\underline{s})) = \max\{\Psi_1, \Psi_2, \Psi_3\}, \text{ if the test at the first stage is a "\textit{failure},"}$$

where

$$\Psi_1 = \lfloor n-t \rfloor \cdot r(\underline{\eta}_1(\underline{s})),$$

$$\Psi_2 = r(\underline{\eta}_1(\underline{s}))\cdot V_{n-t-t}(\underline{\eta}_0(\underline{\eta}_1(\underline{s}))) + (1-r(\underline{\eta}_1(\underline{s})))\cdot V_{n-t-t}(\underline{\eta}_1(\underline{\eta}_1(\underline{s}))),$$

and

$$\Psi_3 = V_{n-t-d}(\underline{\delta}(\underline{\eta}_1(\underline{s}))).$$

A best "*second*" stage activity corresponds to a maximal Ψ.

The development will continue sequentially until "*build*" is chosen. A decision made at any stage is affected by its predecessors and invariably affects its successors. This sequential multistage optimization is commonly known as "*dynamic programming*" [Bellman, 1957].

In the case that $t = d = 1$, the number of possible development policies could be as large as $\frac{2 \cdot 3^n + 3^{n-1} - 1}{2}$. Using direct enumeration of all possible development policies to find a best plan would thus require that one find expected payoffs for each of a set of policies whose size grows exponentially in n. Table 3.1 shows the relationship between budget size and the number of feasible policies. It is impossible to use direct enumeration to identify an optimal development policy for even a small problem with an initial budget of $n = 20$, as one would need to generate and compare expected payoffs for 4.07 billion possible strategies. Therefore, we need to develop a better method that can produce solutions with a reasonable amount of computation.

Table 3.1 Numbers of Feasible Sequences ($t = d = 1$ problems)

n	10	20	50	100	200
$\frac{2 \times 3^n + 3^{n-1} - 1}{2}$	68,890	4.07×10^9	8.38×10^{23}	6.01×10^{47}	3.1×10^{95}

The following sections will describe our analysis in detail, including the properties of the updated $\underline{s}$ after a test and redesign, special cases of the basic recursion (3.5), properties of $V_n(\underline{s})$, the procedure for determining an optimal policy and a maximum return $V_n(\underline{s})$ and how we simulate use of an optimal plan.

3.2 Properties of the Update of $\underline{s}$ after Making a Test

Proposition 1 The expected design reliability after testing is the same as the expected current design reliability:

$$r(\underline{s}) \cdot r(\underline{\eta}_0(\underline{s})) + (1-r(\underline{s}))\cdot r(\underline{\eta}_1(\underline{s})) = r(\underline{s})$$

Proof: Applying equations (3.1), (3.2) and (3.3)

$$r(\underline{s}) \cdot r(\underline{\eta}_0(\underline{s})) = r(\underline{s})\cdot (r_1 \cdot \frac{s_1 \cdot r_1}{r(\underline{s})} + r_2 \cdot \frac{s_2 \cdot r_2}{r(\underline{s})} + \ldots + r_k \cdot \frac{s_k \cdot r_k}{r(\underline{s})})$$

$$= r_1 \cdot s_1 \cdot r_1 + r_2 \cdot s_2 \cdot r_2 + \ldots + r_k \cdot s_k \cdot r_k, \qquad (3.6)$$

and

$$(1-r(\underline{s}))\cdot r(\underline{\eta}_1(\underline{s})) = (1-r(\underline{s}))\cdot (r_1 \cdot \frac{s_1\cdot(1-r_1)}{1-r(\underline{s})} + r_2 \cdot \frac{s_2\cdot(1-r_2)}{1-r(\underline{s})} + \ldots + r_k \cdot \frac{s_k\cdot(1-r_k)}{1-r(\underline{s})})$$

$$= r_1 \cdot s_1 \cdot (1-r_1) + r_2 \cdot s_2 \cdot (1-r_2) + \ldots + r_k \cdot s_k \cdot (1-r_k). \qquad (3.7)$$

Then adding the expressions (3.6) and (3.7) gives $r(\underline{s})$. *Q.E.D.*

This proposition is a direct generalization of the 2-state result of Moon, Vardeman and McBeth [1999] and confirms that testing does not change the design reliability. Testing only provides information on current design reliability.

Proposition 2 $\eta_{1k}(\underline{s}) \leq s_k \leq \eta_{0k}(\underline{s})$ and $\eta_{01}(\underline{s}) \leq s_1 \leq \eta_{11}(\underline{s})$

Proof: First consider showing $\eta_{1k}(\underline{s}) \leq s_k \leq \eta_{0k}(\underline{s})$.

$$s_k - \eta_{1k}(\underline{s}) = s_k - \frac{s_k \cdot (1-r_k)}{1-(r_1 \cdot s_1 + r_2 \cdot s_2 + \ldots + r_k \cdot s_k)}$$

$$= \frac{s_k \cdot [r_k \cdot (1-s_k) - r_1 \cdot s_1 - r_2 \cdot s_2 - \ldots - r_{k-1} \cdot s_{k-1}]}{1-r(\underline{s})}$$

$$= \frac{s_k \cdot [r_k \cdot (s_1 + s_2 + ... + s_{k-1}) - r_1 \cdot s_1 - r_2 \cdot s_2 - .... - r_{k-1} \cdot s_{k-1}]}{1 - r(\underline{s})}$$

$$= \frac{s_k \cdot [(s_1 \cdot (r_k - r_1) + s_2 \cdot (r_k - r_2) + ... + s_{k-1} \cdot (r_k - r_{k-1})]}{1 - r(\underline{s})} \tag{3.8}$$

Since $r_k > r_{k-1} > ... > r_1$, the expression on the right of (3.8) is greater than or equal to 0.

$$\eta_{0k}(\underline{s}) - s_k = \frac{s_k \cdot r_k}{r_1 \cdot s_1 + r_2 \cdot s_2 + ... + r_k \cdot s_k} - s_k$$

$$= \frac{s_k \cdot [r_k \cdot (1 - s_k) - r_1 \cdot s_1 - r_2 \cdot s_2 - .... - r_{k-1} \cdot s_{k-1}]}{r(\underline{s})}$$

$$= \frac{s_k \cdot [r_k \cdot (s_1 + s_2 + ... + s_{k-1}) - r_1 \cdot s_1 - r_2 \cdot s_2 - .... - r_{k-1} \cdot s_{k-1}]}{r(\underline{s})}$$

$$= \frac{s_k((s_1(r_k - r_1) + s_2(r_k - r_2) + ... + s_{k-1}(r_k - r_{k-1}))}{r(\underline{s})} \tag{3.9}$$

Since $r_k > r_{k-1} > ... > r_1$, the expression on the right of (3.9) is greater than or equal to 0 and the promised inequalities for s_k hold.

Now consider showing that $\eta_{01}(\underline{s}) \le s_1 \le \eta_{11}(\underline{s})$.

$$\eta_{11}(\underline{s}) - s_1 = \frac{s_1 \cdot (1 - r_1)}{1 - (r_1 \cdot s_1 + r_2 \cdot s_2 + ... + r_k \cdot s_k)} - s_1$$

$$= \frac{r_1 \cdot s_1 \cdot (s_1 - 1) + s_1 \cdot (r_2 \cdot s_2 + r_3 \cdot s_3 + ... + r_k \cdot s_k)}{1 - r(\underline{s})}$$

Replace $(s_1 - 1)$ with $-(s_2 + s_3 + ... + s_k)$ and the expression becomes:

$$\eta_{11}(\underline{s}) - s_1 = \frac{s_1 \cdot [s_2 \cdot (r_2 - r_1) + s_3 \cdot (r_3 - r_1) + ... + s_k \cdot (r_k - r_1)]}{1 - r(\underline{s})} \tag{3.10}$$

Then since $r_k > r_{k-1} > ... > r_1$, the expression on the right of (3.10) is greater than or equal to 0.

$$s_1 - \eta_{01}(\underline{s}) = s_1 - \frac{s_1 \cdot r_1}{r_1 \cdot s_1 + r_2 \cdot s_2 + ... + r_k \cdot s_k}$$

$$= \frac{s_1 \cdot (r_2 \cdot s_2 + r_3 \cdot s_3 + ... + r_k \cdot s_k) - r_1 \cdot s_1 \cdot (s_1 - 1)}{r_1 \cdot s_1 + r_2 \cdot s_2 + ... + r_k \cdot s_k}$$

Replace $(s_1 - 1)$ with $-(s_2 + s_3 + ... + s_k)$ and the equation becomes:

$$s_1 - \eta_{01}(\underline{s}) = \frac{s_1 \cdot [s_2 \cdot (r_2 - r_1) + s_3 \cdot (r_3 - r_1) + ... + s_k \cdot (r_k - r_1)]}{r(\underline{s})} \tag{3.11}$$

Then since $r_k > r_{k-1} > ... > r_1$, the expression on the right of (3.11) is greater than or equal to 0 and the promised inequalities for s_1 hold. *Q.E.D.*

Proposition 2 generalizes (with a different proof) Proposition 3 of Moon, Vardeman and McBeth [1999] and shows that

1) the probability at the best design reliability state (s_k) will decrease after a failed test but will increase after a successful test, and
2) the probability at the worst design reliability state (s_1) will increase after a failed test but will decrease after a successful test.

3.3 Properties of the Update $\underline{s}$ after a Redesign

Simple properties of stationary finite state Markov chains can be used to establish some properties of the effects of redesign generalizing the 2-state Propositions 4 and 5 of Moon, Vardeman and McBeth [1999].

Proposition 3 (Probability distribution over the states $(s_1, s_2, \ldots, s_k)$ after a single redesign)

Case 1 ($u_{ij} > 0$ for $i \le j$ and $u_{ij} = 0$ for $i > j$): $\delta_k(\underline{s}) \ge s_k$ and $\delta_1(\underline{s}) < s_1$;

Redesign will increase s_k and reduce s_1.

Case 2 ($u_{ii} = 1$ for all $i = 1, 2, \ldots, k$): $\underline{\delta}(\underline{s}) = \underline{s}$; Redesign has no effect on $\underline{s}$

Proposition 4 (Probability distribution over the states $(s_1, s_2, \ldots, s_k)$ under an infinite sequence of redesigns)

Case 1 The Markov chain transition matrix $\underline{u}$ is irreducible, positive recurrent, and aperiodic, then $\underline{s}$ converges to a steady-state probability vector $\underline{\beta} = (\beta_1, \ldots, \beta_k)$ that may be computed by solving the linear equations $\underline{\beta} = \underline{\beta} \cdot \underline{u}$ and $\beta_1 + \beta_2 + \ldots + \beta_k = 1$.

Case 2 ($u_{ij} > 0$ for $i \le j$ and $u_{ij} = 0$ for $i > j$): s_k converges to 1. The redesign Markov chain transition matrix is "non-regressive" and design reliability converges to r_k. (This says that if one makes infinite sequence of non-regressive redesigns, eventually design reliability will be at the best design reliability state.)

Case 3 ($u_{ii} = 1$ for all $i = 1, 2, \ldots, k$): $\underline{\delta}(\underline{s}) = \underline{s}$. Redesign has no effect on $\underline{s}$.

3.4 Special Cases of The General Recursion (3.5)

In this section we present a number of results that amount to special cases of the basic recursion (3.5). These are essentially unchanged from Propositions 6-9 of Moon, Vardeman and McBeth [1999] remaining as valid for *k*-state models as for their 2-state analysis.

Proposition 5 If $n < 1$, $V_n(\underline{s}) = 0$.

This proposition says that one needs resources of at least one system left for the final stockpile to build systems of the final design.

Proposition 6 If $n < 1 + d$, stopping is an optimal next action and $V_n(\underline{s}) = \lfloor n \rfloor \cdot r(\underline{s})$.

Proof:

For $t \geq d$: Here $n < 1 + t$ so making either a test or redesign will reduce the current budget below that required to build at least one system of the final design. Therefore stopping is an optimal next action.

For $t < d$:

Case $(n < 1 + d)$ AND $(n < 1 + t)$: Making either a redesign or a test will reduce the budget below that required to build at least one system of the final design. Therefore stopping is an optimal next action.

Case $(n < 1 + d)$ AND $(1 + t < n < 1 + 2t)$: Stopping and making a test are potentially optimal next actions.

$$V_n(\underline{s}) = \max\{\lfloor n \rfloor \cdot r(\underline{s}),\ r(\underline{s}) \cdot V_{n-t}(\underline{\eta}_0(\underline{s})) + (1 - r(s)) \cdot V_{n-t}(\underline{\eta}_1(\underline{s}))\}$$

$$= \max\{\lfloor n \rfloor \cdot r(\underline{s}),\ r(\underline{s}) \cdot \lfloor n - t \rfloor \cdot r(\underline{\eta}_0(\underline{s})) + (1 - r(s)) \cdot \lfloor n - t \rfloor \cdot r(\underline{\eta}_1(\underline{s}))\}$$

$$= \max\{\lfloor n \rfloor \cdot r(\underline{s}),\ \lfloor n - t \rfloor \cdot [\ r(\underline{s}) \cdot r(\underline{\eta}_0(\underline{s})) + (1 - r(s)) \cdot r(\underline{\eta}_1(\underline{s}))\}$$

Apply Proposition 1 and this becomes

$$V_n(\underline{s}) = \max\{\lfloor n \rfloor \cdot r(\underline{s}),\ \lfloor n - t \rfloor \cdot r(\underline{s})\}.$$

⋮

Case $(n < 1+d)$ AND $(1+(k-1)\cdot t < n < 1+k\cdot t,$ for a positive integer k): The expected payoffs can be determined by induction and applying Proposition 1.

Therefore we can conclude that stopping is an optimal next action. *Q.E.D.*

This proposition says that redesign will not be beneficial if the remaining budget after making a redesign ($n-d$) is below that required to produce one system. Thus this proposition guarantees that eventually a development program will terminate and at least one system of the final design will be built.

Proposition 7 If $n < 1+t+d$, only stopping and redesign are potentially optimal next actions and

$$V_n(\underline{s}) = \max_{l\geq 0 \text{ s.t. } n-l\cdot d\geq 1} \{\lfloor n-l\cdot d\rfloor\cdot r(\underline{\delta}^l(\underline{s}))\}.$$

Proof:

For $t\leq d$: The potential optimal next options are stopping, redesign, or testing and the optimal return is from (3.5)

$$V_n(\underline{s}) = \max\{\lfloor n\rfloor\cdot r(\underline{s}),\ r(\underline{s})\cdot V_{n-t}(\underline{\eta}_0(\underline{s})) + (1-r(\underline{s}))\cdot V_{n-t}(\underline{\eta}_1(\underline{s})),\ V_{n-d}(\underline{\delta}(\underline{s}))\}.$$

An optimal next action after making a test is stopping (using Proposition 6, since the remaining budget after making a test is less than $1+d$). Thus

$$V_n(\underline{s}) = \max\{\lfloor n\rfloor\cdot r(\underline{s}),\ r(\underline{s})\cdot\lfloor n-t\rfloor\cdot r(\underline{\eta}_0(\underline{s})) + (1-r(\underline{s}))\cdot\lfloor n-t\rfloor\cdot r(\underline{\eta}_1(\underline{s})),\ \lfloor n\text{-}d\rfloor\cdot r(\underline{\delta}(\underline{s}))\}$$

$$= \max\{\lfloor n\rfloor\cdot r(\underline{s}),\ \lfloor n-t\rfloor\cdot r(\underline{s})\cdot r(\underline{\eta}_0(\underline{s})) + (1-r(\underline{s}))\cdot r(\underline{\eta}_1(\underline{s})),\ \lfloor n-d\rfloor\cdot r(\underline{\delta}(\underline{s}))\}.$$

Apply Proposition 1 to the second term. The recursion (3.5) becomes

$$V_n(\underline{s}) = \max\{\lfloor n\rfloor\cdot r(\underline{s}),\ \lfloor n-t\rfloor\cdot r(\underline{s}),\ \lfloor n-t\rfloor\cdot r(\underline{\delta}(\underline{s}))\}.$$

The first term is greater than the second term. Therefore, potentially optimal next actions are stopping and redesign.

For $t > d$:

Case $(n < 1+t+d)$ AND $(1+d \le n < 1+2d)$: By the same argument as used in the $t \le d$ case, testing is not an option. Thus, potential actions are stopping and redesign and the expected payoffs are $\lfloor n \rfloor \cdot r(\underline{s})$ and $V_{n-d}(\underline{\delta}(\underline{s}))$ respectively. Then apply Proposition 6 to the second term and it becomes $\lfloor n-d \rfloor \cdot r(\underline{\delta}(\underline{s}))$,

$$\text{so } V_n(\underline{s}) = \max_{l=0,1} \{\lfloor n - l \cdot d \rfloor \cdot r(\underline{\delta}^l(\underline{s})\}.$$

⋮

Case $(n < 1+t+d)$ AND $(1+(l-1)\cdot d \le n < 1+l \cdot d)$ for a positive integer l): Again testing is not an option, and potential next actions are stopping and redesign and the expected payoffs are:

$$V_n(\underline{s}) = \max \{\lfloor n \rfloor \cdot r(\underline{s}),\ V_{n-d}(\underline{\delta}(\underline{s}))\},$$ and by induction

$$V_{n-d}(\underline{\delta}(\underline{s})) = \max_{0 \le m \le l-1} \{\lfloor (n-d) - m \cdot d \rfloor \cdot r(\underline{\delta}^m(\underline{\delta}\underline{s})))\}$$

So

$$V_{n-d}(\underline{\delta}(\underline{s})) = \max_{l \ge 0 \ \text{s.t.}\ n-l\cdot d \ge 1} \{\lfloor n - k \cdot d \rfloor \cdot r(\underline{\delta}^l(\underline{s}))\}$$ and

the possible options are stopping or doing at most $\left\lfloor \frac{n-1}{d} \right\rfloor$ redesigns. *Q.E.D.*

This proposition says that testing is not beneficial if the remaining budget after making a test is not enough to purchase at least one redesign. It is better to stop or do a number of redesigns that produces the maximum expected payoff.

The following is simply a formalization of display (3.5) and says that for large current budgets, stopping, testing and redesign are all potential next actions.

Proposition 8 If $n \geq 1+t+d$, stopping, testing, and redesign are potentially optimal next actions and

$$V_n(\underline{s}) = \max\{\lfloor n \rfloor \cdot r(\underline{s}),\ r(\underline{s}) \cdot V_{n-t}(\underline{\eta}_0(\underline{s})) + (1-r(\underline{s})) \cdot V_{n-t}(\underline{\eta}_1(\underline{s})),\ V_{n-d}(\underline{\delta}(\underline{s}))\}$$

3.5 Properties of $V_n(\underline{s})$

Proposition 9 V_n is monotone nondecreasing in n

Proof: Let $0 < n_1 < n_2$ and let development program 1 be an optimal plan for the budget size n_1. $V_{n_1}(\underline{s})$ is an optimal expected payoff obtained from this plan.

Consider an initial budget n_2 and a development program that at remaining budget m and current distribution over state $\underline{s}$ makes the same choice of development activity as the program 1 for remaining budget $m-(n_2-n_1)$ and probability distribution $\underline{s}$. This plan has expected payoff

$$E(\Pi^* \cdot \lfloor B^* + (n_2 - n_1) \rfloor) = V_{n_1}(\underline{s}) + (n_2 - n_1) \cdot E(\Pi^*) \geq V_{n_1}(\underline{s}).$$

Since the plan is not necessarily optimal

$$V_{n_2}(\underline{s}) \geq V_{n_1}(\underline{s}).$$

Q.E.D.

Proposition 10 $V_n(\underline{s})$ is piecewise linear and convex in $\underline{s}$.

Proof: There are only finitely many possible development programs. For any one of these, the expected payoff is linear in $\underline{s}$. An optimal expected payoff is the maximum of these expected payoffs, so $V_n(\underline{s})$ is convex. *Q.E.D.*

3.6 Analysis of Optimal Development Programs

Our analysis of optimal development programs consists of 2 steps. First, we compute and store $V_m(\underline{s})$ at each possible "remaining budget" point m over a grid of probability distributions for the states (values of $\underline{s}$). Second, we investigate the behavior of the optimal plans using simulation. During the simulation process, an optimal activity at any current budget n_c and current probability vector for the states $\underline{s}_c$ is determined using the information stored in the first step.

3.6.1 Computation of the Optimal Plans and Expected Payoff for an Initial Budget of *n*

The computation of optimal returns of $V_m(\underline{s})$ at each possible "*remaining budget*" point (m) for all possible probability distributions over the states ($\underline{s}$) proceeds by "*backwards induction.*" This process moves from the smallest to the largest possible "*remaining budget*" point. Inputs are

- the redesign transition matrix $\underline{u}$
- the initial budget n
- the test cost t
- the redesign cost d
- the design reliability vector $\underline{r}$
- parameters for a (k, a)-simplex-lattice design specifying the grid of vectors $\underline{s}$ over which optimal payoffs will be evaluated

The procedures for our first step are then:

a) Determine all "possible" remaining budget points, m, that might be reached in the development process using

$$m = n - k_1 \cdot t - k_2 \cdot d \geq 1,$$

where k_1 and k_2 (a number of tests and redesigns in the sequence respectively) are nonnegative integers.

b) Sort the possible remaining budget points in ascending order

$$1 \leq m_1 < m_2 < ... < m_b = n,$$

where b is the total number of possible remaining budget points.

c) Recursively determine optimal returns $V_m(\underline{s})$ for all $\underline{s}$ on a grid by applying Propositions 6-8 (and interpolations where needed), starting from the smallest remaining budget (m_1) and proceeding to the largest remaining budget ($m_b = n$).

- The grids of probability distributions ($\underline{s}$) over the states are generated as elements of a (k, a)-simplex lattice design. So each component of $\underline{s}$ is a multiple of $\frac{1}{a}$, and $s_1 + s_2 + ... + s_k = 1$. We used $a = 5{,}000$ in our analysis.

- The procedure for determining optimal returns $V_m(\underline{s})$ is:

  If $1 \leq m < 1 + t$, $V_m(\underline{s}) = \Psi_1$,

  if $1 + d \leq m < 1 + t + d$, $V_m(\underline{s}) = \max\{\Psi_1, \Psi_2\}$,

  if $1 + t + d \leq m$, $V_m(\underline{s}) = \max\{\Psi_1, \Psi_2, \Psi_3\}$,

  where

  $\Psi_1 = \lfloor m \rfloor \cdot r(\underline{s})$,

$\Psi_2 = r(\underline{s}) \cdot \text{INTERP}\,[V_{m-t}(\underline{\eta}_0(\underline{s}))] + (1-r(\underline{s})) \cdot \text{INTERP}\,[V_{m-t}(\underline{\eta}_1(\underline{s}))]$,

$\Psi_3 = \text{INTERP}\,[V_{m-d}(\underline{\delta}(\underline{s}))]$,

and the interpolation method INTERP[ ] is described in Appendix B.1

3.6.2 Simulating the Behavior of an Optimal Development Plan

We study the behavior of development plans using simulation. Simulation of the development plan for an initial probability distribution, $\underline{s}_0$, and an initial budget of n involves randomly generating test results and the effects of redesigns. During the simulation process, an optimal next activity at any point is determined by consulting the optimal returns stored as described in section 3.6.1.

One simulation "trial" runs as follows. Inputs are

- an initial probability distribution over the states $\underline{s}_0$
- the optimal returns contained in Table of $V_m(\underline{s})$ generated as in section 3.6.1.

Then

a) An initial reliability state is generated according to the initial distribution over the states ($\underline{s}_0$) (see Appendix B.2).

b) Starting at initial budget n and initial $\underline{s}_0$, determine an optimal next activity at any current budget n_c and current probability vector for states $\underline{s}_c$ by using Propositions 6-8 and the stored values of $V_m(\underline{s})$.

c) Depending upon what activity is described in (b), the current budget n_c, the probability vector $\underline{s}_c$, and the current reliability state are updated as follows:

- If the optimal activity is "*redesign,*" the budget is reduced to $n' = n_c - d$, the probability vector is updated to $\underline{s}' = \underline{\delta}(\underline{s}_c)$ and a new real reliability state is generated from the current one using the transition matrix $\underline{u}$ (as described in Appendix B.3).
- If the optimal activity is "*test,*" the budget is reduced to $n' = n_c - t$, the probability vector is updated to $\underline{s}' = \underline{\eta}_0(\underline{s}_c)$ or $\underline{s}' = \underline{\eta}_1(\underline{s}_c)$ depending on a test result which is generated by using the current real design reliability (Π) (see Appendix B.4) and the real design reliability is not changed.

d) The development process is terminated when "*build*" becomes an optimal next activity and the conditional expected number of effective systems built is $\lfloor B^{*} \rfloor \cdot \Pi^{*}$, for B^{*} the final remaining budget and Π^{*} the final realized design reliability.

Steps a) through d) are repeated until a desired number of trials are reached.

3.7 Experimental Parameters for the Simulations

A factorial design in $n, t, d, r,$ and $\underline{u}$ was used in our simulation experiment and the levels used for these parameters are shown in Table 3.2. The numbers of combinations used in this study for the 3-state version of our model is 7,128. For each experimental combination, 25,000 trials were generated. We proceed to offer some discussion of the choices reflected in Table 3.2.

Table 3.2 Values of the $k = 3$ Simulation Experiment Parameters

Parameter	Value(s)
n	1000
t	5, 10, 50
d	5, 10, 50
(k, a)	(3, 10)
g	0.05, 0.50
f	0.25, 0.75, 1.00
(r_1, r_3)	(0.1, 0.5), (0.1, 0.9), (0.8, 0.9)

An initial budget of n is used for purchasing development activities and building the systems of final design. An initial budget of 1,000 systems was used to demonstrate our ability to do computations for even large budgets.

For the sake of investigating the effects of test and redesign costs (t and d) on the behavior of optimal developmental plans, levels of redesign and test costs should include all the possibilities: $t = d$, $t > d$, and $t < d$. A natural choice of test cost is 1. But in some contexts, the cost of a test might be much greater than one system (t might include other direct and indirect costs such as test planning and execution costs in addition to the cost of producing a test system). Although we used integer values in our simulations, t and d need not be integers, depending on the sizes of efforts made.

In practice, the design reliabilities for the states appearing in $\underline{r}$ must be assessed by the group of people involved in product design and development. With no loss of generality, in our calculations we assume that $r_1 < r_2 < ... < r_k$. A reliability vector $\underline{r}$ is characterized by r_1 and r_k and we distribute possible design reliabilities uniformly between the extremes ($r_2 - r_1 = r_3 - r_2 = \cdots = r_k - r_{k-1}$). The larger is k, the better this structure can approximate an arbitrary distribution on [0,1].

An initial probability distribution over the states ($\underline{s}_0$) must be assessed by design engineers or users. For purposes of studying the effect of $\underline{s}_0$ on development program behavior, a simplex-lattice design [Cornell, 1980] is used to generate possible distributions, $\underline{s}_0$, spread evenly over the whole set of potential distributions. The number of initial probability vectors, $\underline{s}_0$, for a (k, a)-simplex-lattice is $\frac{(k+a-1)!}{(a!)(k-1)!}$ and values of this count are given in Table 3.3.

In our simulations, the stationary Markov chain transition matrices ($\underline{u}$) describing the effects of redesigns are characterized by 2 parameters: 1) the diagonal probability (g), and 2) a conditional probability of improving design reliability given a reliability change (f). The diagonal probability represents a probability of staying at the same state through redesign. The fraction f represents the fraction of changes that are improvements in design reliability.

Table 3.3: Size of the (k, a)-Simplex Lattice Design of Initial Vectors $\underline{s}_0$

Model	k	a	A number of initial vectors ($\underline{s}_0$)
3-state	3	10	66
4-state	4	5	56
5-state	5	4	70

Using the following forms for $\underline{u}$, two "non-regressive" $(f = 1)$ and two other transition matrices with possibility of design degradation $(f < 1)$ were created by using $g = 0.05$ and $f = 0.25, 0.75$ and using $g = 0.05, 0.50$ and $f = 1.00$ respectively. (The numerical matrices employed in our work are recorded in Appendix A.)

For $k = 3$

$$\begin{pmatrix} g+(1-f)\cdot(1-g) & \frac{f\cdot(1-g)}{2} & \frac{f\cdot(1-g)}{2} \\ (1-f)\cdot(1-g) & g & f\cdot(1-g) \\ \frac{(1-f)\cdot(1-g)}{2} & \frac{(1-f)\cdot(1-g)}{2} & g+f\cdot(1-g) \end{pmatrix}$$

For $k = 4$

$$\begin{pmatrix} g+(1-f)\cdot(1-g) & \frac{f\cdot(1-g)}{3} & \frac{f\cdot(1-g)}{3} & \frac{f\cdot(1-g)}{3} \\ (1-f)\cdot(1-g) & g & \frac{f\cdot(1-g)}{2} & \frac{f\cdot(1-g)}{2} \\ \frac{(1-f)\cdot(1-g)}{2} & \frac{(1-f)\cdot(1-g)}{2} & g & f\cdot(1-g) \\ \frac{(1-f)\cdot(1-g)}{3} & \frac{(1-f)\cdot(1-g)}{3} & \frac{(1-f)\cdot(1-g)}{3} & g+f\cdot(1-g) \end{pmatrix}$$

For $k = 5$

$$\begin{pmatrix} g+(1-f)\cdot(1-g) & \frac{f\cdot(1-g)}{4} & \frac{f\cdot(1-g)}{4} & \frac{f\cdot(1-g)}{4} & \frac{f\cdot(1-g)}{4} \\ (1-f)\cdot(1-g) & g & \frac{f\cdot(1-g)}{3} & \frac{f\cdot(1-g)}{3} & \frac{f\cdot(1-g)}{3} \\ \frac{(1-f)\cdot(1-g)}{2} & \frac{(1-f)\cdot(1-g)}{2} & g & \frac{f\cdot(1-g)}{2} & \frac{f\cdot(1-g)}{2} \\ \frac{(1-f)\cdot(1-g)}{3} & \frac{(1-f)\cdot(1-g)}{3} & \frac{(1-f)\cdot(1-g)}{3} & g & \frac{f\cdot(1-g)}{1} \\ \frac{(1-f)\cdot(1-g)}{4} & \frac{(1-f)\cdot(1-g)}{4} & \frac{(1-f)\cdot(1-g)}{4} & \frac{(1-f)\cdot(1-g)}{4} & g+f\cdot(1-g) \end{pmatrix}$$

CHAPTER 4. RESULTS AND DISCUSSION

Additional Symbols and Notations

$\underline{u}_a$ the redesign transition matrix for the case of $g = 0.05$ and $f = 0.25$

$\underline{u}_b$ the redesign transition matrix for the case of $g = 0.05$ and $f = 0.75$

$\underline{u}_c$ the redesign transition matrix for the case of $g = 0.05$ and $f = 1.00$

$\underline{u}_d$ the redesign transition matrix for the case of $g = 0.50$ and $f = 1.00$

$\overline{\underline{s}^*}$ simulated average probability distribution over the states at the end of an optimal development program

$\overline{r(\underline{s}^*)}$ simulated average expected reliability at the end of an optimal development program

V_0 mean number of effective systems without any development

$= \lfloor n \rfloor \cdot r(\underline{s}_0)$

$\overline{V^*}$ simulated average number of effective systems at the end of an optimal development program

$= \lfloor B^* \rfloor \cdot \Pi^*$

$\lfloor B^* \rfloor$ simulated average number of systems built in an optimal development program

$\overline{D^*}$ simulated average number of redesigns made in an optimal development program

$\overline{T^*}$ simulated average number of tests made in an optimal development program

$\overline{\Pi^*}$ simulated average actual design reliability at the end of an optimal development program

F the first activity of an optimal development program

$$= \begin{cases} 1 & \text{if a first action is "}\textit{build}\text{"} \\ 2 & \text{if a first action is "}\textit{test}\text{"} \\ 3 & \text{if a first action is "}\textit{redesign}\text{"} \end{cases}$$

$\bar{s}_{kgrw}$ simulated average probability growth at the best reliability state in an optimal development program

$$= \overline{s_k^* - s_{0k}}$$

$\bar{r}_{grw}$ simulated average reliability growth in an optimal development program

$$= \overline{r(\underline{s}^*) - r(\underline{s}_0)}$$

$\bar{V}_{grw}$ simulated average growth in number of effective systems in an optimal development program

$$= \overline{\lfloor B^* \rfloor \cdot \Pi^* - \lfloor n \rfloor \cdot r(\underline{s}_0)}$$

$\overline{DevC}$ simulated average development cost incurred in an optimal development program

$$= \overline{n - \lfloor B^* \rfloor}$$

$\frac{\overline{DevC}}{n}$% simulated average percentage of budget spent on development by an optimal development program

$\frac{\overline{V_{grw}}}{DevC}$ simulated average growth in number of effective systems per unit of development cost in an optimal development program

$$= \overline{\frac{\lfloor B^* \rfloor \cdot \Pi^* - \lfloor n \rfloor \cdot r(\underline{s}_0)}{n - \lfloor B^* \rfloor}}$$

$\overline{\dfrac{V^*}{V_0}}$ simulated average ratio of expected effective systems at the end and beginning of an optimal development program

$= \dfrac{\overline{\lfloor B^* \rfloor \cdot \Pi^*}}{\lfloor n \rfloor \cdot r(\underline{s}_0)}$

SD standard deviation

Results and Discussions

We simulated results using 3, 4, and 5-state models but most of the simulation results and discussions presented in this chapter are based on a 3-state model. Our extensive simulations with 3-state models included optimal plans for of 7,128 different problems. We also did some simulations for 4- and 5-state models to verify that our methods and analyses are capable of handling arbitrary numbers of states and produce qualitatively same results as for the 3-state model.

In this chapter we will investigate how the factors, test cost (t), redesign cost (d), the redesign transition matrix ($\underline{u}$), the design reliability vector ($\underline{r}$), and the initial probability distribution over the states ($\underline{s}_0$) affect the behavior and performance of optimal plans. Most of discussions are based primarily on the extensive simulation results using 3-state reliability models. But in addition, we will observe the relationship between the number of design reliability states and computing time. The discussions are presented in 6 main sections organized as follows:

4.1) For mixed design reliability $\underline{r} = (0.10,0.50,0.90)$

4.1.1) When redesign can produce design degradation (based on Tables 4.1-4.6)

4.1.2) For non-regressive redesigns (based on Table 4.7)

4.2) For high design reliability $\underline{r} = (0.80, 0.85, 0.90)$ (based on Table 4.8)

4.3) For low design reliability $\underline{r} = (0.10, 0.30, 0.50)$ (based on Tables 4.9-4.13)

4.4) Effects of the design reliability vector (based on Tables 4.14-4.15)

4.5) General comment about the effects of the initial probability distribution

4.6) Relationship between computing time and the number of design reliability states (based on Table 4.16)

Sections 4.1-4.3 are based on the results for 3 different design reliability vectors, one per section. The remaining sections are based on the whole set of results across all design reliability vectors. Simulation results are shown in Tables D.1-D.6 in Appendix D and Tables 4.1-4.16 in this chapter.

Tables D.1-D.6 in Appendix D summarize the complete simulation results using 3-state reliability models for $t = d = 5$, $u_a(g = 0.05 \,\&\, f = 0.25)$, and $u_b(g = 0.05 \,\&\, f = 0.75)$. Tables D.1-D.2, D.3-D.4, and D.5-D.6 present results for design reliability vectors: $\underline{r} = (0.10, 0.50, 0.90)$, $(0.10, 0.30, 0.50)$, and $(0.80, 0.85, 0.90)$ respectively. Each appendix table summarizes 25,000 simulation trials at 66 different initial probability distributions $(\underline{s}_0)$. Appendix Tables D.1 through D.6 each have 3 parts, a, b, and c. Part a presents: the initial probability distribution for the states $(\underline{s}_0)$ and average probability distribution at program end $(\overline{\underline{s}^*})$, initial expected reliability $(r(\underline{s}_0))$ and average expected reliability at program end $(\overline{r(\underline{s}^*)})$, the expected number of effective systems without $(V_0 = \lfloor n \rfloor \cdot r(\underline{s}_0))$ and with $(\overline{V^*})$ development, the average numbers of systems built ($\lfloor \overline{B^*} \rfloor$), redesigns made ($\overline{D^*}$) and tests made ($\overline{T^*}$). Part b presents: the optimal first action (F), the average probability growth at the best reliability state ($\bar{s}_{3grw}$), the average expected reliability growth ($\bar{r}_{grw}$), the average growth in number of effective systems ($\bar{V}_{grw}$), the average development cost ($\overline{DevC}$), the average growth in number of effective systems per unit of development cost ($\frac{\bar{V}_{grw}}{\overline{DevC}}$), the average percentage of budget spent on development ($\frac{\overline{DevC}}{n}\%$) and the ratio of expected numbers of effective systems at the end and at the beginning of a development program ($\frac{\overline{V^*}}{V_0} \geq 1$). Part c gives standard deviations (SD) of s_2, s_3, $r(\underline{s}^*)$, V^*, B^*, D^*, and T^*.

The most fundamental measures of performance here are perhaps final expected reliability and expected number of effective systems (which are estimated from the averages of $r(\underline{s}^*)$ and $\Pi^* \cdot \lfloor B^* \rfloor$ respectively). The expected number of effective systems and expected reliability always increase (over $r(\underline{s}_0)$ and V_0) using an optimal development program. Therefore we need additional measures of effectiveness. Many are possible and some examples are summarized in Appendix D. For example, we consider how much the probability of being at the best design reliability state, the expected design reliability, and the expected number of effective systems grow over the course of a program. Reliability growth can be measured by the difference between initial expected reliability ($r(\underline{s}_0)$) and that at the end ($\overline{r(\underline{s}^*)}$) of a program. The maximum reliability growth possible is $r_k - r(\underline{s}_0)$. The difference between $\overline{\Pi^* \cdot \lfloor B^* \rfloor}$ and V_0 measures the increase in the mean number of effective systems under the optimal development program.

The simulation results shown in the tables in this chapter were derived using 10 different initial probability distributions (out of the 66 probability distributions represented in the full set of summaries in Appendix D). Plan characteristics shown in the tables below are: initial probability distribution for the states $(\underline{s}_0)$ and average probability distributions at program end $(\overline{\underline{s}^*})$, initial expected reliability $(r(\underline{s}_0))$ and average expected reliability at program end $(\overline{r(\underline{s}^*)})$, the expected number of effective systems without $(V_0 = \lfloor n \rfloor \cdot r(\underline{s}_0))$ and with $(\overline{V^*})$ development, the optimal first action (F), and the average numbers of systems built $(\overline{\lfloor B^* \rfloor})$, redesigns made $(\overline{D^*})$ and tests made $(\overline{T^*})$. The averages in the tables come from 25,000 simulation trials per case.

4.1 Mixed Design Reliability ($r = (0.10, 0.50, 0.90)$)

The discussions for mixed design reliability are separated into 2 sections based on the nature of redesign (with or without the possibility of design degradation).

4.1.1 Mixed Design Reliability ($r = (0.10, 0.50, 0.90)$) and Redesign Transition Matrices Allowing Design Degradation

Tables 4.1 (for $\underline{u}_a$), and 4.2 (for $\underline{u}_b$) show how the redesign cost affects the behavior of optimal plans. The test cost is fixed at 5 and redesign costs are d = 5, 10, and 50. The redesign transition matrix $(\underline{u}_b)$ used in Table 4.2 is more effective than the one $(\underline{u}_a)$ used in Table 4.1. We find that as the redesign cost increases, the average number of redesigns made by optimal plans decreases. This decreases the optimal mean number of effective systems built and the average final expected reliability. The findings are sensible because when the cost of redesign is high, it is not economical to do many redesigns.

Increasing the redesign cost also affects the number of tests made and the optimal first activity in a development program. As the redesign cost increases, the optimal first activity can change from test to build or from redesign to test. The reason that the optimal first activity changes from test to build is that it is not beneficial to do testing alone without following failed tests by redesign. And when redesign is expensive, it is not economical at any development stage. (Tables 4.1 and 4.2 support the same set of qualitative conclusions.)

Tables 4.3 (for $\underline{u}_a$), and 4.4 (for $\underline{u}_b$) show how the test cost (t) affects the behavior of optimal plans. The redesign cost is fixed at $d = 5$ and test costs are $t = 5$, 10 and 50. We can draw the same conclusions from both tables. As the test cost increases, the average number of tests made by optimal plans decreases. We also find that increasing the test cost reduces the optimal mean number of effective systems and the average final expected reliability. The findings are reasonable. An optimal plan uses few tests when testing is expensive. In such cases there is little empirical reliability information available for design improvement. It is also evident from Tables 4.3 and 4.4 that the optimal first activity in a development program tends to change from test to build or from test to redesign, as the test cost increases.

Table 4.5 shows how the redesign transition matrix affects the behavior of optimal plans. Redesign and test costs are fixed at $t = d = 5$. We find that when a more effective redesign transition matrix is used ($\underline{u}_b$ in place of $\underline{u}_a$), the average numbers of redesigns made and development cost incurred ($n - \lfloor B^* \rfloor$) by optimal plans decrease but the mean number of effective systems and final expected reliability increase. Using a better redesign transition matrix also decreases the number of tests made and tends to change the optimal first activity from test to redesign.

Table 4.1: Simulation Results for the Set of Parameters: $n = 1{,}000$, $t = 5$, $\underline{u}_a (g = 0.05, f = 0.25)$, and $\underline{r} = (0.10, 0.50, 0.90)$

(s_{01}, s_{02}, s_{03})	d	$(\overline{s_1^*}, \overline{s_2^*}, \overline{s_3^*})$	$r(\underline{s}_0)$	$\overline{r(\underline{s}^*)}$	V_0	$\overline{V^*}$	F	$\overline{\lfloor B^* \rfloor}$	$\overline{D^*}$	$\overline{T^*}$
(1.00,0.00,0.00)	5	(0.000,0.055,0.945)	0.100	0.878	100.00	770.15	3	876.71	8.62	16.02
	10	(0.001,0.072,0.927)		0.870		733.26	3	841.09	7.97	15.83
	50	(0.072,0.230,0.698)		0.751		515.26	3	652.19	5.93	10.22
(0.70,0.00,0.30)	5	(0.001,0.040,0.959)	0.340	0.883	340.00	798.22	2	903.09	6.15	13.23
	10	(0.002,0.052,0.946)		0.878		772.71	2	878.36	5.65	13.02
	50	(0.051,0.161,0.788)		0.795		621.73	2	746.43	4.03	9.89
(0.30,0.00,0.70)	5	(0.004,0.017,0.979)	0.660	0.890	660.00	847.12	2	950.90	2.59	7.23
	10	(0.004,0.022,0.974)		0.888		836.68	2	940.81	2.35	7.13
	50	(0.025,0.068,0.907)		0.853		774.23	2	886.67	1.69	5.74
(0.10,0.00,0.90)	5	(0.001,0.006,0.993)	0.820	0.897	820.00	874.80	2	975.19	0.82	4.14
	10	(0.001,0.007,0.991)		0.896		871.08	2	971.61	0.77	4.14
	50	(0.017,0.021,0.962)		0.878		851.70	2	963.21	0.50	2.32
(0.40,0.30,0.30)	5	(0.000,0.053,0.947)	0.460	0.879	460.00	789.92	2	898.67	5.87	14.40
	10	(0.001,0.068,0.931)		0.872		765.46	2	876.50	5.38	13.95
	50	(0.044,0.216,0.740)		0.778		626.31	2	777.52	3.49	9.63
(0.70,0.30,0.00)	5	(0.000,0.056,0.944)	0.220	0.877	220.00	772.70	3	880.27	8.34	15.60
	10	(0.001,0.072,0.927)		0.871		737.46	3	845.79	7.75	15.34
	50	(0.070,0.220,0.709)		0.756		525.95	3	661.01	5.78	10.00
(0.30,0.70,0.00)	5	(0.000,0.053,0.947)	0.380	0.879	380.00	778.04	3	884.87	8.00	15.03
	10	(0.001,0.068,0.931)		0.872		743.96	3	851.49	7.43	14.84
	50	(0.064,0.250,0.731)		0.767		545.81	3	677.26	5.41	10.42
(0.00,0.30,0.70)	5	(0.000,0.048,0.952)	0.780	0.881	780.00	829.45	2	941.30	2.26	9.48
	10	(0.000,0.067,0.932)		0.873		820.74	2	940.01	1.91	8.18
	50	(0.000,0.300,0.700)		0.780		780.00	1	1000.00	0.00	0.00
(0.00,0.70,0.30)	5	(0.000,0.055,0.945)	0.620	0.878	620.00	788.78	2	898.14	5.74	14.64
	10	(0.001,0.068,0.931)		0.872		766.11	2	877.40	5.18	14.17
	50	(0.034,0.309,0.657)		0.749		631.41	2	827.15	2.64	8.18
(0.00,1.00,0.00)	5	(0.001,0.052,0.947)	0.500	0.878	500.00	782.19	3	890.05	7.69	14.30
	10	(0.002,0.066,0.932)		0.872		749.03	3	857.32	7.19	14.15
	50	(0.061,0.194,0.744)		0.773		557.88	3	686.60	5.25	10.18

Table 4.2: Simulation Results for the Set of Parameters: $n = 1{,}000$, $t = 5$, $\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.10, 0.50, 0.90)$

(s_{01}, s_{02}, s_{03})	d	$\overline{(s_1^*, s_2^*, s_3^*)}$	$r(\underline{s}_0)$	$\overline{r(\underline{s}^*)}$	V_0	$\overline{V^*}$	F	$\boxed{B^*}$	$\overline{D^*}$	$\overline{T^*}$
(1.00,0.00,0.00)	**5**	(0.000,0.039,0.960)	0.100	**0.884**	100.00	**848.01**	3	959.32	**3.56**	4.58
	10	(0.000,0.040,0.960)		**0.884**		**833.57**	3	943.17	**3.05**	5.27
	50	(0.001,0.050,0.949)		**0.879**		**743.95**	3	845.65	**2.28**	8.05
(0.70,0.00,0.30)	**5**	(0.001,0.028,0.971)	0.340	**0.888**	340.00	**853.78**	2	961.55	**2.54**	5.15
	10	(0.001,0.028,0.970)		**0.888**		**843.36**	2	949.93	**2.19**	5.64
	50	(0.001,0.035,0.963)		**0.885**		**780.19**	2	881.19	**1.62**	7.61
(0.30,0.00,0.70)	**5**	(0.004,0.012,0.985)	0.660	**0.892**	660.00	**870.62**	2	975.59	**1.07**	3.81
	10	(0.004,0.012,0.984)		**0.892**		**866.23**	2	970.72	**0.91**	4.03
	50	(0.004,0.016,0.980)		**0.890**		**840.12**	2	942.87	**0.67**	4.72
(0.10,0.00,0.90)	**5**	(0.001,0.004,0.995)	0.820	**0.897**	820.00	**882.46**	2	983.39	**0.38**	2.94
	10	(0.001,0.004,0.995)		**0.897**		**880.86**	2	981.62	**0.33**	3.02
	50	(0.001,0.005,0.993)		**0.897**		**872.21**	2	972.24	**0.22**	3.37
(0.40,0.30,0.30)	**5**	(0.001,0.033,0.966)	0.460	**0.886**	460.00	**850.38**	**3**	959.28	**2.75**	5.40
	10	(0.001,0.035,0.965)		**0.886**		**839.72**	**3**	947.93	**2.15**	6.11
	50	(0.001,0.050,0.950)		**0.880**		**781.39**	**2**	888.04	**1.47**	7.70
(0.70,0.30,0.00)	**5**	(0.000,0.039,0.960)	0.220	**0.884**	220.00	**848.27**	3	959.58	**3.52**	4.56
	10	(0.000,0.004,0.960)		**0.884**		**834.04**	3	943.67	**3.02**	5.22
	50	(0.001,0.053,0.946)		**0.878**		**755.40**	3	859.76	**2.12**	6.88
(0.30,0.70,0.00)	**5**	(0.000,0.038,0.962)	0.380	**0.885**	380.00	**852.15**	3	963.34	**2.61**	4.72
	10	(0.000,0.038,0.961)		**0.884**		**841.56**	3	951.69	**2.12**	5.42
	50	(0.001,0.049,0.950)		**0.880**		**774.08**	3	879.59	**1.79**	6.14
(0.00,0.30,0.70)	**5**	(0.000,0.028,0.972)	0.780	**0.889**	780.00	**859.23**	**3**	966.96	**2.09**	4.51
	10	(0.001,0.036,0.963)		**0.885**		**854.13**	**2**	965.14	**0.86**	5.26
	50	(0.001,0.042,0.957)		**0.882**		**833.29**	**2**	944.21	**0.48**	6.32
(0.00,0.70,0.30)	**5**	(0.002,0.032,0.966)	0.620	**0.886**	620.00	**860.13**	**3**	971.27	**2.14**	3.61
	10	(0.002,0.033,0.965)		**0.885**		**851.51**	**3**	962.19	**1.77**	4.03
	50	(0.002,0.038,0.961)		**0.883**		**796.63**	**2**	901.37	**1.25**	7.27
(0.00,1.00,0.00)	**5**	(0.003,0.028,0.970)	0.500	**0.887**	500.00	**861.23**	3	971.02	**2.21**	3.59
	10	(0.003,0.028,0.970)		**0.887**		**852.18**	3	960.81	**1.83**	4.17
	50	(0.003,0.033,0.964)		**0.885**		**793.17**	3	896.21	**1.61**	4.67

Table 4.3: Simulation Results for the Set of Parameters: $n = 1{,}000$, $d = 5$, $\underline{u}_a(g = 0.05, f = 0.25)$, and $\underline{r} = (0.10, 0.50, 0.90)$

(s_{01}, s_{02}, s_{03})	t	$(\overline{s_1^*}, \overline{s_2^*}, \overline{s_3^*})$	$r(\underline{s}_0)$	$\overline{r(\underline{s}^*)}$	V_0	$\overline{V^*}$	F	$\lfloor \overline{B^*} \rfloor$	$\overline{D^*}$	$\overline{T^*}$
	5	(0.000,0.055,0.945)		**0.878**		**770.15**	3	876.71	8.62	**16.02**
(1.00,0.00,0.00)	**10**	(0.005,0.122,0.873)	0.100	**0.847**	100.00	**710.06**	3	836.87	8.04	**12.29**
	50	(0.163,0.229,0.608)		**0.678**		**482.09**	3	688.58	8.83	**5.35**
	5	(0.001,0.040,0.959)		**0.883**		**798.22**	2	903.09	6.15	**13.23**
(0.70,0.00,0.30)	**10**	(0.005,0.090,0.905)	0.340	**0.860**	340.00	**747.23**	2	866.27	5.72	**10.51**
	50	(0.145,0.164,0.691)		**0.718**		**540.62**	2	725.12	5.95	**4.90**
	5	(0.004,0.017,0.979)		**0.890**		**847.12**	2	950.90	2.59	**7.23**
(0.30,0.00,0.70)	**10**	(0.006,0.039,0.955)	0.660	**0.880**	660.00	**818.68**	2	927.96	2.38	**6.31**
	50	(0.090,0.064,0.846)		**0.803**		**703.74**	2	855.45	2.16	**2.68**
	5	(0.001,0.006,0.993)		**0.897**		**874.80**	**2**	975.19	0.82	**4.14**
(0.10,0.00,0.90)	**10**	(0.012,0.012,0.977)	0.820	**0.886**	820.00	**861.85**	**2**	971.85	0.68	**2.47**
	50	(0.100,0.000,0.900)		**0.820**		**820.00**	**1**	1000.00	0.00	**0.00**
	5	(0.0000.053,0.947)		**0.879**		**789.92**	2	898.67	5.87	**14.40**
(0.40,0.30,0.30)	**10**	(0.005,0.131,0.864)	0.460	**0.844**	460.00	**737.44**	2	873.42	5.30	**10.01**
	50	(0.139,0.273,0.587)		**0.679**		**552.69**	2	798.83	3.98	**3.63**
	5	(0.000,0.056,0.944)		**0.877**		**772.70**	3	880.27	8.34	**15.60**
(0.70,0.30,0.00)	**10**	(0.006,0.122,0.872)	0.220	**0.846**	220.00	**714.56**	3	842.86	7.79	**11.82**
	50	(0.165,0.219,0.616)		**0.680**		**486.52**	3	691.28	7.95	**5.38**
	5	(0.000,0.053,0.947)		**0.879**		**778.04**	3	884.87	8.00	**15.03**
(0.30,0.70,0.00)	**10**	(0.006,0.116,0.879)	0.380	**0.849**	380.00	**721.96**	3	848.38	7.42	**11.45**
	50	(0.162,0.207,0.631)		**0.688**		**500.47**	3	702.84	7.54	**5.19**
	5	(0.000,0.048,0.952)		**0.881**		**829.45**	**2**	941.30	2.26	**9.48**
(0.00,0.30,0.70)	**10**	(0.002,0.117,0.881)	0.780	**0.852**	780.00	**798.20**	**2**	936.22	1.73	**5.51**
	50	(0.000,0.300,0.700)		**0.780**		**780.00**	**1**	1000.00	0.00	**0.00**
	5	(0.000,0.055,0.945)		**0.878**		**788.78**	**2**	898.14	5.74	**14.64**
(0.00,0.70,0.30)	**10**	(0.004,0.117,0.879)	0.620	**0.850**	620.00	**734.82**	**2**	863.30	5.26	**11.04**
	50	(0.000,0.700,0.300)		**0.620**		**620.00**	**1**	1000.00	0.00	**0.00**
	5	(0.001,0.052,0.947)		**0.878**		**782.19**	3	890.05	7.69	**14.30**
(0.00,1.00,0.00)	**10**	(0.006,0.111,0.883)	0.500	**0.851**	500.00	**728.35**	3	854.00	7.14	**11.03**
	50	(0.157,0.194,0.649)		**0.697**		**511.54**	3	708.25	7.36	**5.10**

Table 4.4: Simulation Results for the Set of Parameters: $n = 1{,}000$, $d = 5$, $\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.10, 0.50, 0.90)$

(s_{01}, s_{02}, s_{03})	t	$(\overline{s_1^*}, \overline{s_2^*}, \overline{s_3^*})$	$r(\underline{s}_0)$	$\overline{r(\underline{s}^*)}$	V_0	$\overline{V^*}$	F	$\lfloor \overline{B^*} \rfloor$	$\overline{D^*}$	$\overline{T^*}$
	5	(0.000,0.039,0.960)		**0.884**		**848.01**	3	959.32	3.56	**4.58**
(1.00,0.00,0.00)	**10**	(0.002,0.054,0.944)	0.100	**0.877**	100.00	**829.06**	3	945.26	3.49	**3.73**
	50	(0.025,0.111,0.864)		**0.836**		**757.91**	3	906.91	4.27	**1.47**
	5	(0.001,0.028,0.971)		**0.888**		**853.78**	**2**	961.55	2.54	**5.15**
(0.70,0.00,0.30)	**10**	(0.002,0.039,0.959)	0.340	**0.883**	340.00	**832.02**	**2**	942.29	2.49	**4.52**
	50	(0.024,0.109,0.867)		**0.837**		**759.44**	**3**	907.31	4.26	**1.43**
	5	(0.004,0.012,0.985)		**0.892**		**870.62**	2	975.59	1.07	**3.81**
(0.30,0.00,0.70)	**10**	(0.005,0.025,0.970)	0.660	**0.886**	660.00	**855.30**	2	964.82	1.21	**2.91**
	50	(0.038,0.037,0.925)		**0.854**		**786.16**	2	919.39	1.39	**1.47**
	5	(0.001,0.004,0.995)		**0.897**		**882.46**	2	983.39	0.38	**2.94**
(0.10,0.00,0.90)	**10**	(0.011,0.005,0.984)	0.820	**0.889**	820.00	**872.83**	2	981.78	0.33	**1.66**
	50	(0.015,0.020,0.966)		**0.880**		**823.18**	2	934.15	0.58	**1.26**
	5	(0.001,0.033,0.966)		**0.886**		**850.38**	3	959.28	2.75	**5.40**
(0.40,0.30,0.30)	**10**	(0.003,0.067,0.930)	0.460	**0.871**	460.00	**830.86**	3	954.37	3.26	**2.93**
	50	(0.025,0.112,0.862)		**0.835**		**761.17**	3	911.89	3.27	**1.43**
	5	(0.000,0.039,0.960)		**0.884**		**848.27**	3	959.58	3.52	**4.56**
(0.70,0.30,0.00)	**10**	(0.002,0.053,0.945)	0.220	**0.877**	220.00	**829.43**	3	945.48	3.46	**3.72**
	50	(0.024,0.109,0.866)		**0.837**		**759.07**	3	907.16	4.26	**1.43**
	5	(0.000,0.038,0.962)		**0.885**		**852.15**	3	963.34	2.61	**4.72**
(0.30,0.70,0.00)	**10**	(0.002,0.053,0.945)	0.380	**0.877**	380.00	**832.97**	3	949.60	2.58	**3.75**
	50	(0.024,0.107,0.869)		**0.838**		**760.57**	3	907.47	4.25	**1.43**
	5	(0.000,0.028,0.972)		**0.889**		**859.23**	3	966.96	2.09	**4.51**
(0.00,0.30,0.70)	**10**	(0.003,0.049,0.949)	0.780	**0.878**	780.00	**844.74**	3	961.57	2.08	**2.80**
	50	(0.022,0.079,0.899)		**0.851**		**784.39**	3	921.69	1.85	**1.38**
	5	(0.002,0.032,0.966)		**0.886**		**860.13**	3	971.27	2.14	**3.61**
(0.00,0.70,0.30)	**10**	(0.003,0.043,0.954)	0.620	**0.880**	620.00	**845.57**	3	960.57	2.08	**2.93**
	50	(0.027,0.067,0.906)		**0.851**		**782.57**	3	918.61	2.20	**1.41**
	5	(0.003,0.028,0.970)		**0.887**		**861.23**	3	971.02	2.21	**3.59**
(0.00,1.00,0.00)	**10**	(0.004,0.040,0.957)	0.500	**0.881**	500.00	**846.38**	3	960.39	2.15	**2.89**
	50	(0.031,0.059,0.910)		**0.851**		**780.58**	3	916.37	2.30	**1.44**

Table 4.5: Simulation Results for the Set of Parameters: $n = 1{,}000$, $t = 5, d = 5$, with $\underline{r} = (0.10, 0.50, 0.90)$, $\underline{u}_a(g = 0.05, f = 0.25)$, and $\underline{u}_b(g = 0.05, f = 0.75)$

(s_{01}, s_{02}, s_{03})	$\underline{u}$	$(\overline{s_1^*}, \overline{s_2^*}, \overline{s_3^*})$	$r(\underline{s}_0)$	$\overline{r(\underline{s}^*)}$	V_0	$\overline{V^*}$	F	$\lfloor B^* \rfloor$	$\overline{D^*}$	$\overline{T^*}$
(1.00,0.00,0.00)	$\underline{u}_a$	(0.000,0.055,0.945)	0.100	**0.878**	100.00	**770.15**	3	876.71	**8.62**	16.02
	$\underline{u}_b$	(0.000,0.039,0.960)		**0.884**		**848.01**	3	959.32	**3.56**	4.58
0.70,0.00,0.30)	$\underline{u}_a$	(0.001,0.040,0.959)	0.340	**0.883**	340.00	**798.22**	2	903.09	**6.15**	13.23
	$\underline{u}_b$	(0.001,0.028,0.971)		**0.888**		**853.78**	2	961.55	**2.54**	5.15
(0.30,0.00,0.70)	$\underline{u}_a$	(0.004,0.017,0.979)	0.660	**0.890**	660.00	**847.12**	2	950.90	**2.59**	7.23
	$\underline{u}_b$	(0.004,0.012,0.985)		**0.892**		**870.62**	2	975.59	**1.07**	3.81
(0.10,0.00,0.90)	$\underline{u}_a$	(0.001,0.006,0.993)	0.820	**0.897**	820.00	**874.80**	2	975.19	**0.82**	4.14
	$\underline{u}_b$	(0.001,0.004,0.995)		**0.897**		**882.46**	2	983.39	**0.38**	2.94
(0.40,0.30,0.30)	$\underline{u}_a$	(0.000,0.053,0.947)	0.460	**0.879**	460.00	**789.92**	2	898.67	**5.87**	14.40
	$\underline{u}_b$	(0.001,0.033,0.966)		**0.886**		**850.38**	3	959.28	**2.75**	5.40
(0.70,0.30,0.00)	$\underline{u}_a$	(0.000,0.056,0.944)	0.220	**0.877**	220.00	**772.70**	3	880.27	**8.34**	15.60
	$\underline{u}_b$	(0.000,0.039,0.960)		**0.884**		**848.27**	3	959.58	**3.52**	4.56
(0.30,0.70,0.00)	$\underline{u}_a$	(0.000,0.053,0.947)	0.380	**0.879**	380.00	**778.04**	3	884.87	**8.00**	15.03
	$\underline{u}_b$	(0.000,0.038,0.962)		**0.885**		**852.15**	3	963.34	**2.61**	4.72
(0.00,0.30,0.70)	$\underline{u}_a$	(0.000,0.048,0.952)	0.780	**0.881**	780.00	**829.45**	2	941.30	**2.26**	9.48
	$\underline{u}_b$	(0.000,0.028,0.972)		**0.889**		**859.23**	3	966.96	**2.09**	4.51
(0.00,0.70,0.30)	$\underline{u}_a$	(0.000,0.055,0.945)	0.620	**0.878**	620.00	**788.78**	2	898.14	**5.74**	14.64
	$\underline{u}_b$	(0.002,0.032,0.966)		**0.886**		**860.13**	3	971.27	**2.14**	3.61
(0.00,1.00,0.00)	$\underline{u}_a$	(0.001,0.052,0.947)	0.500	**0.878**	500.00	**782.19**	3	890.05	**7.69**	14.30
	$\underline{u}_b$	(0.003,0.028,0.970)		**0.887**		**861.23**	3	971.02	**2.21**	3.59

4.1.2 Mixed Design Reliability ($r = (0.10, 0.50, 0.90)$) and Non-Regressive Redesign Transition Matrix

In this section we investigate the behavior of optimal plans when redesign ($f = 1$) always improves system reliability. We consider 2 non-regressive redesign transition matrixes: $\underline{u}_c$ (f=1 & $g = 0.05$) and $\underline{u}_d$ (f=1 & $g = 0.50$). The redesign transition matrix $\underline{u}_c$ is more effective than the redesign transition matrix $\underline{u}_d$ because a probability of staying at the same state (g) is smaller.

Table 4.6 summarizes simulation results using the most effective redesign transition matrix ($\underline{u}_c$). The test cost is fixed at $t = 5$ and redesign costs are $d = 5$, 10 and 50. Since $\underline{u}_c$ is the best design reliability matrix, the importance of redesign dominates that of testing when the redesign cost is not high. This effect can be seen in that no tests are made by any of optimal plans, when the redesign cost is 5. But redesign is less dominant when it is more expensive.

Table 4.7 shows how the probability of staying at the same reliability state (g) affects the behavior of optimal plans in non-regressive redesign problems. Redesign and test costs are fixed at $t = d = 5$. The redesign transition matrix $\underline{u}_d$ has a larger probability of staying at the same state after redesign than the matrix $\underline{u}_c$. Development programs using redesign transition matrix $\underline{u}_c$ require less development resources ($n - \lfloor B^* \rfloor$), but obtain larger mean numbers of effective systems.

Since the redesign transition matrices we have used have fairly special structure we must be cautious about making conclusions concerning the effects of $\underline{u}$ on the behavior of optimal plans. But our simulations do show that results for non-regressive redesigns do not necessary dominate results for other $\underline{u}$'s. If the parameter *g* used for a non-regressive redesign transition matrix is much larger than one used for another redesign transition matrix allowing design degradation, the second mechanism may nevertheless produce better overall results.

Comparing the simulation results for $\underline{u}_c$ in Table 4.6 with the results for $\underline{u}_a$ and $\underline{u}_b$ in Table 4.5, we see that a first activity of an optimal program tends to become redesign and important performance measures are larger as the parameter *f* increases (for fixed parameter *g*).

4.2 High Design Reliability ($r = (0.80, 0.850, 0.90)$)

Table 4.8 summarizes simulation results using $\underline{u}_b$, $t = 5$, and $d = 5$, 10 and 50. The behavior of optimal plans is "unusual" for these cases, since no test is made in any optimal plan but only redesign, repeated redesigns, or immediate build. This unique behavior occurs across all 495 combinations of parameter investigated ($t = d = 5$, 10 and 50, redesign transition matrices ($\underline{u}_a$, $\underline{u}_b$, $\underline{u}_c$, and $\underline{u}_d$) and (66) initial probability distributions). Since the initial expected reliability is very high (the lowest expected reliability is 0.8 at $\underline{s}_0 = (1,0,0)$), a possibility of test failure at any reliability state is very low and testing does not produce much useful information. Testing would only waste limited development resources, if the testing method does not provide a basis to discriminate effectively among reliability states.

Table 4.6: Simulation Results for the Set of Parameters: $n = 1{,}000$, $t = 5$, $\underline{u}_c(g = 0.05, f = 1.0)$, and $\underline{r} = (0.10,0.50,0.90)$

(s_{01}, s_{02}, s_{03})	d	$(\overline{s_1^*}, \overline{s_2^*}, \overline{s_3^*})$	$r(\underline{s}_0)$	$\overline{r(\underline{s}^*)}$	V_0	$\overline{V^*}$	F	$\lfloor \overline{B^*} \rfloor$	$\overline{D^*}$	$\overline{T^*}$
(1.00,0.00,0.00)	5	(0.000,0.004,0.996)	0.100	0.898	100.00	885.00	3	985.00	3.00	**0.00**
	10	(0.000,0.004,0.996)		0.898		871.52	3	970.00	3.00	0.00
	50	(0.000,0.028,0.972)		0.888		791.72	3	891.41	2.04	1.36
(0.70,0.00,0.30)	5	(0.000,0.002,0.998)	0.340	0.899	340.00	885.45	3	985.00	3.00	**0.00**
	10	(0.000,0.002,0.998)		0.899		871.96	3	970.00	3.00	0.00
	50	(0.001,0.021,0.978)		0.891		813.59	2	913.21	1.46	2.75
(0.30,0.00,0.70)	5	(0.000,0.001,0.999)	0.660	0.900	660.00	886.05	3	985.00	3.00	**0.00**
	10	(0.003,0.001,0.996)		0.897		878.76	2	979.80	1.10	1.83
	50	(0.004,0.008,0.988)		0.894		854.08	2	955.55	0.61	2.82
(0.10,0.00,0.90)	5	(0.000,0.005,0.995)	0.820	0.898	820.00	888.92	3	990.00	2.00	**0.00**
	10	(0.001,0.001,0.998)		0.899		884.96	2	984.51	0.33	2.44
	50	(0.001,0.003,0.996)		0.898		876.23	2	976.23	0.20	2.75
(0.40,0.30,0.30)	5	(0.000,0.003,0.996)	0.460	0.899	460.00	885.88	3	985.00	3.00	**0.00**
	10	(0.001,0.010,0.979)		0.891		873.47	3	980.00	2.00	0.00
	50	(0.000,0.038,0.962)		0.885		813.06	2	918.90	1.12	5.00
(0.70,0.30,0.00)	5	(0.000,0.003,0.997)	0.220	0.899	220.00	885.43	3	985.00	3.00	**0.00**
	10	(0.000,0.003,0.997)		0.899		871.95	3	970.00	3.00	0.00
	50	(0.000,0.041,0.959)		0.883		797.81	3	903.21	1.56	3.72
(0.30,0.70,0.00)	5	(0.000,0.001,0.999)	0.380	0.900	380.00	886.01	3	985.00	3.00	**0.00**
	10	(0.000,0.016,0.983)		0.893		875.14	3	980.00	2.00	0.00
	50	(0.000,0.034,0.965)		0.886		812.70	3	917.17	1.35	3.09
(0.00,0.30,0.70)	5	(0.000,0.001,0.999)	0.780	0.900	780.00	890.70	3	990.00	2.00	**0.00**
	10	(0.000,0.015,0.985)		0.894		885.06	3	990.00	1.00	0.00
	50	(0.000,0.034,0.966)		0.886		850.84	2	959.96	0.48	3.21
(0.00,0.70,0.30)	5	(0.000,0.002,0.998)	0.620	0.899	620.00	890.31	3	990.00	2.00	**0.00**
	10	(0.000,0.002,0.998)		0.899		881.31	3	980.00	2.00	0.00
	50	(0.000,0.035,0.965)		0.886		841.73	3	950.00	1.00	0.00
(0.00,1.00,0.00)	5	(0.000,0.003,0.997)	0.500	0.899	500.00	890.01	3	990.00	2.00	**0.00**
	10	(0.000,0.003,0.997)		0.899		881.02	3	980.00	2.00	0.00
	50	(0.000,0.029,0.971)		0.888		835.92	3	941.09	1.04	1.34

Table 4.7: Simulation for the Set of Parameters: $n = 1{,}000$, $t = 5, d = 5$, with $\underline{r} = (0.10, 0.50, 0.90)$, $\underline{u}_c(g = 0.05, f = 1.0)$, and $\underline{u}_d(g = 0.50, f = 1.0)$

(s_{01}, s_{02}, s_{03})	$\underline{u}$	$(\overline{s_1^*}, \overline{s_2^*}, \overline{s_3^*})$	$r(\underline{s}_0)$	$\overline{r(\underline{s}^*)}$	V_0	$\overline{V^*}$	F	$\lfloor \overline{B^*} \rfloor$	$\overline{D^*}$	$\overline{T^*}$
(1.00,0.00,0.00)	$\underline{u}_c$	(0.000,0.004,0.996)	0.100	0.898	100.00	**885.00**	3	**985.00**	3.00	0.00
	$\underline{u}_d$	(0.001,0.014,0.985)		0.894		**855.44**	3	**957.08**	7.44	1.15
0.70,0.00,0.30)	$\underline{u}_c$	(0.000,0.002,0.998)	0.340	0.899	340.00	**885.00**	3	**985.00**	3.00	0.00
	$\underline{u}_d$	(0.002,0.009,0.989)		0.895		**859.26**	2	**960.00**	5.32	2.68
(0.30,0.00,0.70)	$\underline{u}_c$	(0.000,0.001,0.999)	0.660	0.900	660.00	**886.05**	3	**985.00**	3.00	0.00
	$\underline{u}_d$	(0.004,0.006,0.990)		0.895		**873.60**	2	**976.55**	2.43	2.26
(0.10,0.00,0.90)	$\underline{u}_c$	(0.000,0.005,0.995)	0.820	0.898	820.00	**888.92**	3	**990.00**	2.00	0.00
	$\underline{u}_d$	(0.001,0.002,0.997)		0.898		**883.26**	3	**983.30**	0.73	2.55
(0.40,0.30,0.30)	$\underline{u}_c$	(0.000,0.003,0.996)	0.460	0.899	460.00	**885.88**	3	**985.00**	3.00	0.00
	$\underline{u}_d$	(0.003,0.013,0.984)		0.892		**860.96**	3	**965.00**	7.00	0.00
(0.70,0.30,0.00)	$\underline{u}_c$	(0.000,0.003,0.997)	0.220	0.899	220.00	**885.43**	3	**985.00**	3.00	0.00
	$\underline{u}_d$	(0.002,0.017,0.981)		0.892		**857.58**	3	**961.61**	6.68	1.00
(0.30,0.70,0.00)	$\underline{u}_c$	(0.000,0.001,0.999)	0.380	0.900	380.00	**886.01**	3	**985.00**	3.00	0.00
	$\underline{u}_d$	(0.002,0.014,0.984)		0.893		**861.41**	3	**965.00**	7.00	0.00
(0.00,0.30,0.70)	$\underline{u}_c$	(0.000,0.001,0.999)	0.780	0.900	780.00	**890.70**	3	**990.00**	2.00	0.00
	$\underline{u}_d$	(0.000,0.019,0.981)		0.892		**874.65**	3	**980.00**	4.00	0.00
(0.00,0.70,0.30)	$\underline{u}_c$	(0.000,0.002,0.998)	0.620	0.899	620.00	**890.31**	3	**990.00**	2.00	0.00
	$\underline{u}_d$	(0.000,0.022,0.978)		0.891		**868.97**	3	**975.00**	5.00	0.00
(0.00,1.00,0.00)	$\underline{u}_c$	(0.000,0.003,0.997)	0.500	0.899	500.00	**890.01**	3	**990.00**	2.00	0.00
	$\underline{u}_d$	(0.000,0.016,0.984)		0.894		**866.94**	3	**970.00**	6.00	0.00

Table 4.8: Simulation Results for the Set of Parameters: $n = 1{,}000$, $t = 5$, $\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r}$ = **(0.80, 0.85, 0.90)**

(s_{01}, s_{02}, s_{03})	d	$(\overline{s_1^*}, \overline{s_2^*}, \overline{s_3^*})$	$r(\underline{s}_0)$	$\overline{r(\underline{s}^*)}$	V_0	$\overline{V^*}$	F	$\lfloor \overline{B^*} \rfloor$	$\overline{D^*}$	$\overline{T^*}$
	5	(0.210,0.163,0.628)		0.871		862.20	3	990.00	2.00	**0.00**
(1.00,0.00,0.00)	10	(0.210,0.163,0.628)	0.800	0.871	800.00	853.49	3	980.00	2.00	**0.00**
	50	(0.287,0.356,0.356)		0.853		810.76	3	950.00	1.00	**0.00**
	5	(0.193,0.155,0.652)		0.873		864.24	3	990.00	2.00	**0.00**
(0.70,0.00,0.30)	10	(0.193,0.155,0.652)	0.830	0.873	830.00	855.51	3	980.00	2.00	**0.00**
	50	(0.700,0.000,0.300)		0.830		830.00	1	1000.00	0.00	**0.00**
	5	(0.300,0.000,0.700)		0.870		870.00	1	1000.00	0.00	**0.00**
(0.30,0.00,0.70)	10	(0.300,0.000,0.700)	0.870	0.870	870.00	870.00	1	1000.00	0.00	**0.00**
	50	(0.300,0.000,0.700)		0.870		870.00	1	1000.00	0.00	**0.00**
	5	(0.100,0.000,0.900)		0.890		890.00	1	1000.00	0.00	**0.00**
(0.10,0.00,0.90)	10	(0.100,0.000,0.900)	0.890	0.890	890.00	890.00	1	1000.00	0.00	**0.00**
	50	(0.100,0.000,0.900)		0.890		890.00	1	1000.00	0.00	**0.00**
	5	(0.179,0.158,0.663)		0.874		865.43	3	990.00	2.00	**0.00**
(0.40,0.30,0.30)	10	(0.220,0.193,0.585)	0.845	0.868	845.00	859.47	3	990.00	1.00	**0.00**
	50	(0.400,0.300,0.300)		0.845		845.00	1	1000.00	0.00	**0.00**
	5	(0.196,0.165,0.639)		0.872		863.40	3	990.00	2.00	**0.00**
(0.70,0.30,0.00)	10	(0.196,0.165,0.639)	0.815	0.872	815.00	854.68	3	980.00	2.00	**0.00**
	50	(0.273,0.264,0.463)		0.860		8.16.55	3	950.00	1.00	**0.00**
	5	(0.178,0.169,0.653)		0.874		864.99	3	990.00	2.00	**0.00**
(0.30,0.70,0.00)	10	(0.252,0.145,0.606)	0.835	0.868	835.00	858.98	3	990.00	1.00	**0.00**
	50	(0.300,0.700,0.000)		0.835		835.00	1	1000.00	0.00	**0.00**
	5	(0.000,0.300,0.700)		0.885		885.00	1	1000.00	0.00	**0.00**
(0.00,0.30,0.70)	10	(0.000,0.300,0.700)	0.885	0.885	885.00	885.00	1	1000.00	0.00	**0.00**
	50	(0.000,0.300,0.700)		0.885		885.00	1	1000.00	0.00	**0.00**
	5	(0.220,0.071,0.727)		0.876		871.90	3	995.00	1.00	**0.00**
(0.00,0.70,0.30)	10	(0.220,0.071,0.727)	0.865	0.876	865.00	867.52	3	990.00	1.00	**0.00**
	50	(0.000,0.700,0.300)		0.865		865.00	1	1000.00	0.00	**0.00**
	5	(0.238,0.050,0.712)		0.874		869.38	3	995.00	1.00	**0.00**
(0.00,1.00,0.00)	10	(0.238,0.050,0.712)	0.850	0.874	850.00	865.01	3	990.00	1.00	**0.00**
	50	(0.000,1.000,0.000)		0.850		850.00	1	1000.00	0.00	**0.00**

4.3 Low Design Reliability (r = (0.10,0.30,0.50)

Tables 4.9-4.13 summarize simulation results for low design reliability cases. Tables 4.9 (for $\underline{u}_a$), and 4.10 (for $\underline{u}_b$) show how the redesign cost (d) affects the behavior of optimal plans. Redesign cost is fixed at $t = 5$ and test costs are $d = 5$, 10 and 50.

Tables 4.11 (for $\underline{u}_a$), and 4.12 (for $\underline{u}_b$) show how the test cost (t) affects the behavior of optimal plans. Redesign cost is fixed at $d = 5$ and test costs are $t = 5$, 10 and 50. Table 4.13 shows how the redesign transition matrix affects the behavior of optimal plans. The patterns in these tables are consistent with the earlier findings in Section 4.1, where $\underline{r} = (0.10,0.50,0.90)$.

4.4 Effects of Design Reliability Vector ($\underline{r}$)

Tables 4.14 (for u_a) and 4.15 (for u_b) enable comparisons of the behavior of optimal plans for different design reliability vectors ($\underline{r}$ = (0.10,0.30,0.50), (0.10,0.50,0.90), and (0.80,0.85,0.90)). We find that optimal programs for low design reliability employ more tests and redesigns than optimal programs for high design reliability. This finding agrees with intuition that when reliability is low, more development resources should be devoted to improve current design reliability.

4.5 Effects of the Initial Probability Distribution (s_0)

We have considered all the simulation results of Appendix D to find how initial probability distributions over reliability states affects the behavior of an optimal develop program. At the beginning of a development program, developers must assess the likelihood of being at each design reliability state. This distribution describes what current reliabilities are most plausible and determine what strategies are needed to attain the development goals. Different initial probability distributions require different development strategies.

Typically, a problem with a very low relative expected reliability ($\frac{r(\underline{s}_0)}{r_k}$) requires more development effort than one with a higher relative expected reliability. A best first activity for a problem with a very low relative expected reliability is likely to be redesign. But a best first activity in a problem with a high relative expected reliability is likely to be build, since we have high confidence that the current redesign reliability cannot be improved. These observations are clear in limiting/extreme case. Where $\underline{s}_0 = (1,0,0)$, the best first activity is always redesign and where $\underline{s}_0 = (0,0,1)$, the best first activity is always build. But the general observations are not universally true, because development strategies also depend on other factors such as test and redesign costs, and characteristics of the redesign transition matrix.

4.6 Relationship Between Computing Time and Number of Design Reliability States

Table 4.16 shows some average computing times for 3-state, 4-state, and 5-state models. The computing time is composed of 2 parts. First, the set-up time is that used to build a table containing optimal returns for all possible probability distributions at all possible remaining budget points. The set-up time for a given *k* and *n* is approximately constant in the other problem parameters and mostly depends on the number of $\underline{s}$ grid points used. Second, an average simulation time is used to study a development plan. The average (across a number of initial distributions ($\underline{s}_0$) used) simulation times of the development programs for 3, 4, and 5-state models are displayed for 66, 56, and 70 initial distributions $\underline{s}_0$ respectively. As we expect, the computing time increases exponentially with number of design reliability states.

Table 4.9: Simulation Results for the Set of Parameters: $n = 1{,}000$, $t = 5$, $\underline{u}_a(g = 0.05, f = 0.25)$, and $\underline{r} = (0.10, 0.30, 0.50)$

(s_{01}, s_{02}, s_{03})	d	$(\overline{s_1^*}, \overline{s_2^*}, \overline{s_3^*})$	$r(\underline{s}_0)$	$\overline{r(\underline{s}^*)}$	V_0	$\overline{V^*}$	F	$\lfloor \overline{B^*} \rfloor$	$\overline{D^*}$	$\overline{T^*}$
	5	(0.030,0.209,0.761)		0.466		366.73	3	818.20	11.70	24.66
(1.00,0.00,0.00)	10	(0.045,0.232,0.723)	0.100	0.436	100.00	344.54	3	783.83	8.13	26.98
	50	(0.213,0.268,0.519)		0.361		249.54	3	655.75	4.73	21.50
	5	(0.029,0.154,0.817)		0.458		387.65	2	841.59	8.44	23.24
(0.70,0.00,0.30)	10	(0.042,0.168,0.790)	0.220	0.449	220.00	370.68	2	814.34	5.81	25.52
	50	(0.171,0.188,0.641)		0.394		305.85	2	731.69	3.26	21.07
	5	(0.026,0.062,0.912)		0.477		439.00	2	915.01	3.41	13.59
(0.30,0.00,0.70)	10	(0.031,0.070,0.899)	0.380	0.474	380.00	432.23	2	904.90	2.36	14.30
	50	(0.090,0.074,0.836)		0.449		406.68	2	876.53	1.26	12.12
	5	(0.026,0.017,0.957)		0.486		471.33	2	967.78	0.97	5.48
(0.10,0.00,0.90)	10	(0.028,0.019,0.953)	0.460	0.485	460.00	469.62	2	965.18	0.64	5.68
	50	(0.049,0.018,0.933)		0.477		462.85	2	962.13	0.31	4.47
	5	(0.026,0.227,0.748)		0.444		381.22	2	855.74	7.53	21.32
(0.40,0.30,0.30)	10	(0.037,0.252,0.712)	0.280	0.435	280.00	366.56	2	837.22	4.95	22.65
	50	(0.139,0.327,0.533)		0.379		319.61	2	819.81	2.05	15.51
	5	(0.030,0.205,0.765)		0.447		368.70	3	821.07	11.43	24.36
(0.70,0.30,0.00)	10	(0.046,0.226,0.728)	0.160	0.437	160.00	346.06	3	785.00	7.82	27.35
	50	(0.209,0.254,0.537)		0.365		255.42	3	661.22	4.65	21.23
	5	(0.029,0.193,0.778)		0.450		373.50	3	826.45	10.55	24.17
(0.30,0.70,0.00)	10	(0.044,0.212,0.744)	0.240	0.440	240.00	351.55	3	790.45	7.48	26.96
	50	(0.150,0.554,0.296)		0.329		264.04	2	798.09	2.42	16.22
	5	(0.000,0.300,0.700)		0.440		440.00	1	1000.00	0.00	0.00
(0.00,0.30,0.70)	10	(0.000,0.300,0.700)	0.440	0.440	440.00	440.00	1	1000.00	0.00	0.00
	50	(0.000,0.300,0.700)		0.440		440.00	1	1000.00	0.00	0.00
	5	(0.023,0.252,0.725)		0.440		378.85	2	859.59	7.84	20.26
(0.00,0.70,0.30)	10	(0.021,0.402,0.577)	0.360	0.411	360.00	366.26	2	893.63	3.40	14.48
	50	(0.000,0.700,0.300)		0.360		360.00	1	1000.00	0.00	0.00
	5	(0.029,0.182,0.789)		0.452		376.38	3	827.64	10.09	24.39
(0.00,1.00,0.00)	10	(0.045,0.201,0.754)	0.300	0.442	300.00	355.73	3	796.04	7.29	26.22
	50	(0.000,1.00,0.000)		0.300		300.00	1	1000.00	0.00	0.00

Table 4.10: Simulation Results for the Set of Parameters: $n = 1{,}000$, $t = 5$, $\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.10, 0.30, 0.50)$

(s_{01}, s_{02}, s_{03})	d	$(\overline{s_1^*}, \overline{s_2^*}, \overline{s_3^*})$	$r(\underline{s}_0)$	$\overline{r(\underline{s}^*)}$	V_0	$\overline{V^*}$	F	$\lfloor \overline{B^*} \rfloor$	$\overline{D^*}$	$\overline{T^*}$
	5	(0.009,0.087,0.904)		0.479		451.65	3	942.84	4.43	7.01
(1.00,0.00,0.00)	10	(0.009,0.093,0.898)	0.100	0.478	100.00	441.76	3	924.66	3.63	7.81
	50	(0.016,0.151,0.833)		0.464		385.54	3	831.11	2.51	8.65
	5	(0.009,0.085,0.907)		0.480		452.51	3	943.40	4.37	6.95
(0.70,0.00,0.30)	10	(0.010,0.080,0.910)	0.220	0.480	220.00	444.06	2	924.58	3.04	8.99
	50	(0.017,0.117,0.866)		0.470		401.36	2	852.14	1.86	10.95
	5	(0.012,0.034,0.955)		0.489		465.62	2	952.75	1.74	7.71
(0.30,0.00,0.70)	10	(0.013,0.033,0.954)	0.380	0.488	380.00	462.18	2	945.77	1.22	8.40
	50	(0.020,0.048,0.932)		0.482		444.76	2	919.84	0.74	8.68
	5	(0.017,0.009,0.974)		0.491		479.24	2	975.33	0.47	4.47
(0.10,0.00,0.90)	10	(0.018,0.010,0.972)	0.460	0.491	460.00	478.33	2	974.04	0.35	4.49
	50	(0.019,0.014,0.967)		0.490		473.28	2	965.39	0.21	4.80
	5	(0.008,0.084,0.908)		0.480		452.85	3	943.66	4.34	6.92
(0.40,0.30,0.30)	10	(0.010,0.097,0.893)	0.280	0.477	280.00	444,38	3	932.28	3.03	7.48
	50	(0.016,0.143,0.841)		0.465		403.66	3	867.37	1.83	8.18
	5	(0.009,0.086,0.905)		0.479		452.00	3	943.15	4.40	6.97
(0.70,0.30,0.00)	10	(0.009,0.093,0.898)	0.160	0.478	160.00	442.26	3	925.63	3.60	7.68
	50	0.016,0.161,0.823)		0.461		391.94	3	849.03	2.14	8.78
	5	(0.010,0.086,0.904)		0.479		453.46	3	947.17	3.50	7.06
(0.30,0.70,0.00)	10	(0.009,0.089,0.901)	0.240	0.478	240.00	445.80	3	931.74	2.70	8.26
	50	(0.017,0.128,0.855)		0.468		405.98	3	867.05	1.80	8.57
	5	(0.009,0.068,0.923)		0.483		460.49	3	953.80	2.55	6.69
(0.00,0.30,0.70)	10	(0.007,0.089,0.903)	0.440	0.479	440.00	455.76	2	951.05	1.44	6.91
	50	(0.004,0.195,0.801)		0.459		442.50	2	963.67	0.34	3.87
	5	(0.011,0.060,0.929)		0.484		460.65	3	952.40	2.61	6.91
(0.00,0.70,0.30)	10	(0.012,0.064,0.924)	0.360	0.482	360.00	454.81	3	942.50	2.08	7.33
	50	(0.018,0.085,0.896)		0.476		421.81	3	885.22	1.54	7.56
	5	(0.013,0.054,0.934)		0.484		460.84	3	951.36	2.69	7.04
(0.00,1.00,0.00)	10	(0.013,0.056,0.932)	0.300	0.484	300.00	454.84	3	939.91	2.18	7.66
	50	(0.018,0.077,0.905)		0.477		420.20	3	877.97	1.62	8.19

Table 4.11: Simulation Results for the Set of Parameters: $n = 1{,}000$, $d = 5$, $\underline{u}_a(g = 0.05, f = 0.25)$, and $\underline{r} = (0.10, 0.30, 0.50)$

(s_{01}, s_{02}, s_{03})	t	$(\overline{s_1^*}, \overline{s_2^*}, \overline{s_3^*})$	$r(\underline{s}_0)$	$\overline{r(\underline{s}^*)}$	V_0	$\overline{V^*}$	F	$\lfloor \overline{B^*} \rfloor$	$\overline{D^*}$	$\overline{T^*}$
(1.00,0.00,0.00)	5	(0.030,0.209,0.761)	0.100	0.466	100.00	366.73	3	818.20	11.70	24.66
	10	(0.097,0.231,0.673)		0.415		323.12	3	768.21	11.41	17.48
	50	(0.419,0.212,0.370)		0.290		219.58	3	739.76	9.80	4.22
(0.70,0.00,0.30)	5	(0.029,0.154,0.817)	0.220	0.458	220.00	387.65	2	841.59	8.44	23.24
	10	(0.097,0.170,0.733)		0.427		344.17	2	792.42	7.61	16.96
	50	(0.425,0.129,0.447)		0.304		240.58	2	765.08	5.17	4.18
(0.30,0.00,0.70)	5	(0.026,0.062,0.912)	0.380	0.477	380.00	439.00	2	915.01	3.41	13.59
	10	(0.080,0.064,0.856)		0.455		414.02	2	900.20	2.77	8.59
	50	(0.300,0.000,0.700)		0.380		380.00	1	1000.00	0.00	0.00
(0.10,0.00,0.90)	5	(0.026,0.017,0.957)	0.460	0.486	460.00	471.33	2	967.78	0.97	5.48
	10	(0.042,0.017,0.942)		0.480		460.98	2	956.25	0.73	4.01
	50	(0.100,0.000,0.900)		0.460		460.00	1	1000.00	0.00	0.00
(0.40,0.30,0.30)	5	(0.026,0.227,0.748)	0.280	0.444	280.00	381.22	2	855.74	7.53	21.32
	10	(0.083,0.260,0.658)		0.415		343.98	2	821.78	6.68	14.48
	50	(0.139,0.327,0.533)		0.280		280.00	1	1000.00	0.00	0.00
(0.70,0.30,0.00)	5	(0.030,0.205,0.765)	0.160	0.447	160.00	368.70	3	821.07	11.43	24.36
	10	(0.097,0.226,0.677)		0.416		325.09	3	771.35	10.44	17.64
	50	(0.421,0.212,0.367)		0.289		219.51	3	742.12	8.90	4.27
(0.30,0.70,0.00)	5	(0.029,0.193,0.778)	0.240	0.450	240.00	373.50	3	826.45	10.55	24.17
	10	(0.095,0.213,0.692)		0.419		329.72	3	775.46	9.62	17.64
	50	(0.150,0.554,0.296)		0.240		240.00	1	1000.00	0.00	0.00
(0.00,0.30,0.70)	5	(0.000,0.300,0.700)	0.440	0.440	440.00	440.00	1	1000.00	0.00	0.00
	10	(0.000,0.300,0.700)		0.440		440.00	1	1000.00	0.00	0.00
	50	(0.000,0.300,0.700)		0.440		440.00	1	1000.00	0.00	0.00
(0.00,0.70,0.30)	5	(0.023,0.252,0.725)	0.360	0.440	360.00	378.85	2	859.59	7.84	20.26
	10	(0.000,0.700,0.300)		0.600		360.00	1	1000.00	0.00	0.00
	50	(0.000,0.700,0.300)		0.360		360.00	1	1000.00	0.00	0.00
(0.00,1.00,0.00)	5	(0.029,0.182,0.789)	0.300	0.452	300.00	376.38	3	827.64	10.09	24.39
	10	(0.093,0.203,0.704)		0.422		333.93	3	779.15	9.34	17.41
	50	(0.000,1.000,0.000)		0.300		300.00	1	1000.00	0.00	0.00

Table 4.12: Simulation Results for the Set of Parameters: $n = 1{,}000$, $d = 5$, $\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.10, 0.30, 0.50)$

(s_{01}, s_{02}, s_{03})	t	$(\overline{s_1^*}, \overline{s_2^*}, \overline{s_3^*})$	$r(\underline{s}_0)$	$\overline{r(\underline{s}^*)}$	V_0	$\overline{V^*}$	F	$\lfloor \overline{B^*} \rfloor$	$\overline{D^*}$	$\overline{T^*}$
(1.00,0.00,0.00)	5	(0.009,0.087,0.904)	0.100	0.479	100.00	451.65	3	942.84	4.43	7.01
	10	(0.017,0.102,0.881)		0.473		437.13	3	924.45	4.24	5.44
	50	(0.167,0.149,0.684)		0.403		395.40	3	980.00	4.00	0.00
(0.70,0.00,0.30)	5	(0.009,0.085,0.907)	0.220	0.480	220.00	452.51	3	943.40	4.37	6.95
	10	(0.017,0.101,0.882)		0.473		438.23	3	925.90	4.13	5.35
	50	(0.166,0.149,0.686)		0.404		395.93	2	980.00	4.00	0.00
(0.30,0.00,0.70)	5	(0.012,0.034,0.955)	0.380	0.489	380.00	465.62	2	952.75	1.74	7.71
	10	(0.024,0.049,0.927)		0.481		449.75	2	935.75	1.96	5.52
	50	(0.133,0.093,0.774)		0.428		403.15	3	940.76	1.85	1.00
(0.10,0.00,0.90)	5	(0.017,0.009,0.974)	0.460	0.491	460.00	479.24	2	975.33	0.47	4.47
	10	(0.026,0.012,0.962)		0.487		470.29	2	964.99	0.47	3.27
	50	(0.10,0.000,0.900)		0.460		460.00	1	1000.00	0.00	0.00
(0.40,0.30,0.30)	5	(0.008,0.084,0.908)	0.280	0.480	280.00	452.85	3	943.66	4.34	6.92
	10	(0.017,0.101,0.882)		0.473		438.71	3	927.02	4.09	5.25
	50	(0.168,0.150,0.682)		0.403		396.74	3	985.00	3.00	0.00
(0.70,0.30,0.00)	5	(0.009,0.086,0.905)	0.160	0.479	160.00	452.00	3	943.15	4.40	6.97
	10	(0.016,0.101,0.883)		0.473		437.56	3	924.19	4.18	5.49
	50	(0.166,0.149,0.685)		0.404		395.73	3	980.00	4.00	0.00
(0.30,0.70,0.00)	5	(0.010,0.086,0.904)	0.240	0.479	240.00	453.46	3	947.17	3.50	7.06
	10	(0.017,0.097,0.886)		0.474		438.93	3	926.34	3.81	5.46
	50	(0.169,0.150,0.682)		0.403		396.49	3	985.00	3.00	0.00
(0.00,0.30,0.70)	5	(0.009,0.068,0.923)	0.440	0.483	440.00	460.49	3	953.80	2.55	6.69
	10	(0.015,0.136,0.849)		0.467		447.87	2	959.88	1.45	3.29
	50	(0.000,0.300,0.700)		0.440		440.00	1	1000.00	0.00	0.00
(0.00,0.70,0.30)	5	(0.011,0.060,0.929)	0.360	0.484	360.00	460.65	3	952.40	2.61	6.91
	10	(0.032,0.073,0.895)		0.473		446.35	3	943.98	2.68	4.26
	50	(0.122,0.110,0.768)		0.429		403.13	3	939.04	2.19	1.00
(0.00,1.00,0.00)	5	(0.013,0.054,0.934)	0.300	0.484	300.00	460.84	3	951.36	2.69	7.04
	10	(0.020,0.066,0.914)		0.479		446.03	3	931.21	2.89	5.44
	50	(0.124,0.106,0.770)		0.429		401.91	3	935.91	2.82	1.00

Table 4.13: Simulation Results for the Set of Parameters: $n = 1{,}000$, $t = 5, d = 5$, with $\underline{r} = (0.10, 0.30, 0.50)$, $\underline{u}_a(g = 0.05, f = 0.25)$, and $\underline{u}_b(g = 0.05, f = 0.75)$

(s_{01}, s_{02}, s_{03})	$\underline{u}$	$(\overline{s_1^*}, \overline{s_2^*}, \overline{s_3^*})$	$r(\underline{s}_0)$	$\overline{r(\underline{s}^*)}$	V_0	$\overline{V^*}$	F	$\overline{B^*}$	$\overline{D^*}$	$\overline{T^*}$
(1.00,0.00,0.00)	$\underline{u}_a$	(0.030,0.209,0.761)	0.100	0.466	100.00	366.73	3	818.20	11.70	24.66
	$\underline{u}_b$	(0.009,0.087,0.904)		0.479		451.65	3	942.84	4.43	7.01
(0.70,0.00,0.30)	$\underline{u}_a$	(0.029,0.154,0.817)	0.220	0.458	220.00	387.65	2	841.59	8.44	23.24
	$\underline{u}_b$	(0.009,0.085,0.907)		0.480		452.51	3	943.40	4.37	6.95
(0.30,0.00,0.70)	$\underline{u}_a$	(0.026,0.062,0.912)	0.380	0.477	380.00	439.00	2	915.01	3.41	13.59
	$\underline{u}_b$	(0.012,0.034,0.955)		0.489		465.62	2	952.75	1.74	7.71
(0.10,0.00,0.90)	$\underline{u}_a$	(0.026,0.017,0.957)	0.460	0.486	460.00	471.33	2	967.78	0.97	5.48
	$\underline{u}_b$	(0.017,0.009,0.974)		0.491		479.24	2	975.33	0.47	4.47
(0.40,0.30,0.30)	$\underline{u}_a$	(0.026,0.227,0.748)	0.280	0.444	280.00	381.22	2	855.74	7.53	21.32
	$\underline{u}_b$	(0.008,0.084,0.908)		0.480		452.85	3	943.66	4.34	6.92
(0.70,0.30,0.00)	$\underline{u}_a$	(0.030,0.205,0.765)	0.160	0.447	160.00	368.70	3	821.07	11.43	24.36
	$\underline{u}_b$	(0.009,0.086,0.905)		0.479		452.00	3	943.15	4.40	6.97
(0.30,0.70,0.00)	$\underline{u}_a$	(0.029,0.193,0.778)	0.240	0.450	240.00	373.50	3	826.45	10.55	24.17
	$\underline{u}_b$	(0.010,0.086,0.904)		0.479		453.46	3	947.17	3.50	7.06
(0.00,0.30,0.70)	$\underline{u}_a$	(0.000,0.300,0.700)	0.440	0.440	440.00	440.00	1	1000.00	0.00	0.00
	$\underline{u}_b$	(0.009,0.068,0.923)		0.483		460.49	3	953.80	2.55	6.69
(0.00,0.70,0.30)	$\underline{u}_a$	(0.023,0.252,0.725)	0.360	0.440	360.00	378.85	2	859.59	7.84	20.26
	$\underline{u}_b$	(0.011,0.060,0.929)		0.484		460.65	3	952.40	2.61	6.91
(0.00,1.00,0.00)	$\underline{u}_a$	(0.029,0.182,0.789)	0.300	0.452	300.00	376.38	3	827.64	10.09	24.39
	$\underline{u}_b$	(0.013,0.054,0.934)		0.484		460.84	3	951.36	2.69	7.04

Table 4.14: Simulation Results for the Set of Parameters: $n = 1{,}000$, $t = 5, d = 5$, and $\underline{u}_a(g = 0.05, f = 0.25)$

(s_{01}, s_{02}, s_{03})	$\underline{r}$	$r(\underline{s}_0)$	$\overline{r(\underline{s}^*)}$	V_0	$\overline{V^*}$	F	$\lfloor \overline{B^*} \rfloor$	$\overline{D^*}$	$\overline{T^*}$
	(0.10,0.30,0.50)	0.100	0.466	100.00	366.73	3	**818.20**	11.70	24.66
(1.00,0.00,0.00)	**(0.10,0.50,0.90)**	0.100	0.878	100.00	770.15	3	**876.71**	8.62	16.02
	(0.80,0.85,0.90)	0.800	0.822	800.00	814.00	3	**990.00**	2.00	0.00
	(0.10,0.30,0.50)	0.220	0.458	220.00	387.65	2	**841.59**	8.44	23.24
0.70,0.00,0.30)	**(0.10,0.50,0.90)**	0.340	0.883	340.00	798.22	2	**903.09**	6.15	13.23
	(0.80,0.85,0.90)	0.830	0.830	830.00	830.00	1	**1000.00**	0.00	0.00
	(0.10,0.30,0.50)	0.380	0.477	380.00	439.00	2	**915.01**	3.41	13.59
(0.30,0.00,0.70)	**(0.10,0.50,0.90)**	0.660	0.890	660.00	847.12	2	**950.90**	2.59	7.23
	(0.80,0.85,0.90)	0.870	0.870	870.00	870.00	1	**1000.00**	0.00	0.00
	(0.10,0.30,0.50)	0.460	0.486	460.00	471.33	2	**967.78**	0.97	5.48
(0.10,0.00,0.90)	**(0.10,0.50,0.90)**	0.820	0.897	820.00	874.80	2	**975.19**	0.82	4.14
	(0.80,0.85,0.90)	0.890	0.890	890.00	890.00	1	**1000.00**	0.00	0.00
	(0.10,0.30,0.50)	0.280	0.444	280.00	381.22	2	**855.74**	7.53	21.32
(0.40,0.30,0.30)	**(0.10,0.50,0.90)**	0.460	0.879	460.00	789.92	2	**898.67**	5.87	14.40
	(0.80,0.85,0.90)	0.845	0.845	845.00	845.00	1	**1000.00**	0.00	0.00
	(0.10,0.30,0.50)	0.160	0.447	160.00	368.70	3	**821.07**	11.43	24.36
(0.70,0.30,0.00)	**(0.10,0.50,0.90)**	0.220	0.877	220.00	772.70	3	**880.27**	8.34	15.60
	(0.80,0.85,0.90)	0.815	0.820	815.00	816.24	3	**995.00**	1.00	0.00
	(0.10,0.30,0.50)	0.240	0.450	240.00	373.50	3	**826.45**	10.55	24.17
(0.30,0.70,0.00)	**(0.10,0.50,0.90)**	0.380	0.879	380.00	778.04	3	**884.87**	8.00	15.03
	(0.80,0.85,0.90)	0.835	0.835	835.00	835.00	1	**1000.00**	0.00	0.00
	(0.10,0.30,0.50)	0.440	0.440	440.00	440.00	1	**1000.00**	0.00	0.00
(0.00,0.30,0.70)	**(0.10,0.50,0.90)**	0.780	0.881	780.00	829.45	2	**941.30**	2.26	9.48
	(0.80,0.85,0.90)	0.885	0.885	885.00	885.00	1	**1000.00**	0.00	0.00
	(0.10,0.30,0.50)	0.360	0.440	360.00	378.85	2	**859.59**	7.84	20.26
(0.00,0.70,0.30)	**(0.10,0.50,0.90)**	0.620	0.878	620.00	788.78	2	**898.14**	5.74	14.64
	(0.80,0.85,0.90)	0.865	0.865	865.00	865.00	1	**1000.00**	0.00	0.00
	(0.10,0.30,0.50)	0.300	0.452	300.00	376.38	3	**827.64**	10.09	24.39
(0.00,1.00,0.00)	**(0.10,0.50,0.90)**	0.500	0.878	500.00	782.19	3	**890.05**	7.69	14.30
	(0.80,0.85,0.90)	0.850	0.850	850.00	850.00	1	**1000.00**	0.00	0.00

Table 4.15: Simulation Results for the Set of Parameters: $n = 1{,}000$, $t = 5, d = 5$, and $\underline{u}_b(g = 0.05, f = 0.75)$

(s_{01}, s_{02}, s_{03})	$\underline{r}$	$r(\underline{s}_0)$	$\overline{r(\underline{s}^*)}$	V_0	$\overline{V^*}$	F	$\lfloor \overline{B^*} \rfloor$	$\overline{D^*}$	$\overline{T^*}$
(1.00,0.00,0.00)	**(0.10,0.30,0.50)**	0.100	0.479	100.00	451.65	3	**942.84**	4.43	7.01
	(0.10,0.50,0.90)	0.100	0.884	100.00	848.01	3	**959.32**	3.56	4.58
	(0.80,0.85,0.90)	0.800	0.871	800.00	862.20	3	**990.00**	2.00	0.00
0.70,0.00,0.30)	**(0.10,0.30,0.50)**	0.220	0.480	220.00	452.51	3	**943.40**	4.37	6.95
	(0.10,0.50,0.90)	0.340	0.888	340.00	853.78	2	**961.55**	2.54	5.15
	(0.80,0.85,0.90)	0.830	0.873	830.00	864.24	3	**990.00**	2.00	0.00
(0.30,0.00,0.70)	**(0.10,0.30,0.50)**	0.380	0.489	380.00	465.62	2	**952.75**	1.74	7.71
	(0.10,0.50,0.90)	0.660	0.892	660.00	870.62	2	**975.59**	1.07	3.81
	(0.80,0.85,0.90)	0.870	0.870	870.00	870.00	1	**1000.00**	0.00	0.00
(0.10,0.00,0.90)	**(0.10,0.30,0.50)**	0.460	0.491	460.00	479.24	2	**975.33**	0.47	4.47
	(0.10,0.50,0.90)	0.820	0.897	820.00	882.46	2	**983.39**	0.38	2.94
	(0.80,0.85,0.90)	0.890	0.890	890.00	890.00	1	**1000.00**	0.00	0.00
(0.40,0.30,0.30)	**(0.10,0.30,0.50)**	0.280	0.480	280.00	452.85	3	**943.66**	4.34	6.92
	(0.10,0.50,0.90)	0.460	0.886	460.00	850.38	3	**959.28**	2.75	5.40
	(0.80,0.85,0.90)	0.845	0.874	845.00	865.43	3	**990.00**	2.00	0.00
(0.70,0.30,0.00)	**(0.10,0.30,0.50)**	0.160	0.479	160.00	452.00	3	**943.15**	4.40	6.97
	(0.10,0.50,0.90)	0.220	0.884	220.00	848.27	3	**959.58**	3.52	4.56
	(0.80,0.85,0.90)	0.815	0.872	815.00	863.40	3	**990.00**	2.00	0.00
(0.30,0.70,0.00)	**(0.10,0.30,0.50)**	0.240	0.479	240.00	453.46	3	**947.17**	3.50	7.06
	(0.10,0.50,0.90)	0.380	0.885	380.00	852.15	3	**963.34**	2.61	4.72
	(0.80,0.85,0.90)	0.835	0.874	835.00	864.99	3	**990.00**	2.00	0.00
(0.00,0.30,0.70)	**(0.10,0.30,0.50)**	0.440	0.483	440.00	460.49	3	**953.80**	2.55	6.69
	(0.10,0.50,0.90)	0.780	0.889	780.00	859.23	3	**966.96**	2.09	4.51
	(0.80,0.85,0.90)	0.885	0.885	885.00	885.00	1	**1000.00**	0.00	0.00
(0.00,0.70,0.30)	**(0.10,0.30,0.50)**	0.360	0.484	360.00	460.65	3	**952.40**	2.61	6.91
	(0.10,0.50,0.90)	0.620	0.886	620.00	860.13	3	**971.27**	2.14	3.61
	(0.80,0.85,0.90)	0.865	0.876	865.00	871.90	3	**995.00**	1.00	0.00
(0.00,1.00,0.00)	**(0.10,0.30,0.50)**	0.300	0.484	300.00	460.84	3	**951.36**	2.69	7.04
	(0.10,0.50,0.90)	0.500	0.887	500.00	861.23	3	**971.02**	2.21	3.59
	(0.80,0.85,0.90)	0.850	0.874	850.00	869.38	3	**995.00**	1.00	0.00

Table 4.16: Computing Time for $t = d = 5$, $(r_1, r_k) = (0.10, 0.90)$, and $n = 1{,}000$

	Computing Time (Minutes)		
	3-State Model	4-State Model	5-State Model
Set-up Time	39.000	314.000	2,058.000
Average Simulation Time for Problem 1 (using u_a)	0.197	1.697	9.685
Average Simulation Time for Problem 2 (using u_b)	0.061	0.411	2.871

CHAPTER 5. MODIFICATION OF k-STATE MODELS ALLOWING ACCELERATED TESTING OF HIGH RELIABILITY SYSTEMS

5.1 Introduction

The primary objective of this chapter is to identify means of improving optimal development plans for very high reliability cases. 495 optimal plans analyzed in Chapter 4 for the high reliability case of $\underline{r} = (0.80, 0.85, 0.90)$ (with 66 initial probability distributions $(\underline{s}_0)$, redesign transition matrixes $\underline{u}_a, \underline{u}_b, \underline{u}_c$ and $\underline{u}_d$, test and redesign costs of 5, 10, and 50) all have the same basic character. They immediately build, redesign, or repeatedly redesign without making any tests at all. This accords with the two-state analysis of Moon, Vardeman, and McBeth [1999]. Moon [1996] examined behaviors of optimal programs where redesign reliability is high: $\underline{r} = (0.95, 0.99)$ and (0.990,0.999). Moon found that optimal actions at any development stage were only "redesign" or "build" and raised the question about this unusual behavior of optimal plans "if no testing is allowed, why redesign (potentially, repeatedly)?"

In the model used thus, optimal development programs fail to do any testing because individual Bernoulli observations are uninformative for discriminating between large reliabilities. However, we may possibly artificially raise test failure probabilities $(\underline{p} = \underline{1} - \underline{r})$. If acceleration factors for testing are available, the present analysis can modified, corresponding optimal policies produced, and the effectiveness of development potentially improved.

Many modern products like electronic devices and defense systems are designed to have high reliability. Therefore few units fail under normal use conditions. This means that it is difficult to obtain reliability information testing under these conditions. We need to incorporate into development plans effective testing techniques that can provide informative information for design improvement within a reasonable period of time and with reasonable resources [Feinberg, 1994]. Accelerated testing has been used extensively and widely in manufacturing devices like semiconductors, microelectronics, lasers, electronic devices, and mechanical components [Feinberg and Gibson, 1993] to obtain timely information on the reliability of product components [Meeker and Escobar 1998]. Testing can be accelerated by increasing the use-rate, the aging-rate, or the level of stress of products [Breyfogle, 1994, and Meeker and Escobar, 1998]. "Care must be exercised when choosing an accelerated test strategy. A model that does not closely follow the characteristics of a device can result in an invalid conclusion." [Breyfogle, 1994]

In this chapter, we will introduce a generalization of our basic model that allows for accelerated testing. We will find optimal plans for this generalized model and investigate their behavior when acceleration is used. Where acceleration proves advantageous, we will consider what acceleration factors produce the best development results.

5.2 General *k*-State Models Allowing for Accelerated Testing

A model allowing accelerated testing can be made from the *k*-state model of previous chapters. Modifications are required only in the testing component. We use a modified test failure probability vector $(\underline{p}_a)$ in place of the test failure probability vector $(\underline{p} = \underline{1} - \underline{r})$ that is appropriate for testing under normal use conditions. The modified test failure probability vector $(\underline{p}_a)$ is obtained by multiplying $\underline{p}$ by an acceleration constant $a_f \geq 1$. ($a_f = 1$ describes normal use conditions.) Therefore the modified test failure probability vector is bigger than under normal use conditions.

In this chapter parameters subscribed by "a" will be defined as in previous chapters except for modification of test failure probabilities by multiplication by a_f. So we let

$$r_{ai} = 1 - p_{ai} \qquad \text{for } i = 1, 2, \ldots, k$$

where

$$p_{ai} = p_i \cdot a_f$$

or

$$p_{ai} = (1 - r_i) \cdot a_f$$

for

$$1 \leq a_f \leq \frac{1}{p_1}.$$

Let

$$r_a(\underline{s}) = r_{a1} \cdot s_1 + r_{a2} \cdot s_2 + \ldots + r_{ak} \cdot s_k$$

$r_a(\underline{s})$ is the expected reliability of current design under accelerated use conditions. Then the updated distribution over reliability states after an accelerated test is

$$\underline{s}' \equiv (\eta_{a01}(\underline{s}), \eta_{a02}(\underline{s}), \ldots, \eta_{a0k}(\underline{s})), \text{ if a test is successful, } X = 0$$

where

$$\eta_{a0i}(\underline{s}) = \frac{s_i \cdot r_{ai}}{r_a(\underline{s})} \qquad \text{for } i = 1, 2, \ldots, k$$

and

$$\underline{s}' \equiv (\eta_{a11}(\underline{s}), \eta_{a12}(\underline{s}), \ldots, \eta_{a1k}(\underline{s})), \text{ if a test is a failure, } X = 1$$

where

$$\eta_{a1i}(\underline{s}) = \frac{s_i \cdot (1 - r_{ai})}{1 - r_a(\underline{s})} \qquad \text{for } i = 1, 2, \ldots, k$$

Therefore the expected final return after accelerated testing is

$$r_a(\underline{s}) \cdot V_{n-t}(\underline{\eta}_{a0}(\underline{s})) + (1 - r_a(\underline{s})) \cdot V_{n-t}(\underline{\eta}_{a1}(\underline{s}))$$

Then the optimal return function for the modified model allowing for accelerated testing is

$$V_n(\underline{s}) = \max \{\Psi_1, \Psi_2, \Psi_3\}$$

for

$$\Psi_1 = \lfloor n \rfloor \cdot r(\underline{s}),$$

$$\Psi_2 = r_a(\underline{s}) \cdot V_{n-t}(\underline{\eta}_{a0}(\underline{s})) + (1 - r_a(\underline{s})) \cdot V_{n-t}(\underline{\eta}_{a1}(\underline{s})),$$

and

$$\Psi_3 = V_{n-d}(\underline{\delta}(\underline{s})).$$

5.3 Analysis of Optimal Development Programs

All Propositions (1-10) presented for k-state models without acceleration in Chapter 3 are still valid for the modified model allowing accelerated testing. We can therefore use the same analysis as described in Section 3.6.

5.4 Simulation Experiment Parameters

Table 5.1 shows the levels of factors used in our (factorial) simulation experiment. The total number of parameter combinations used in this study is 8,316 (and

25,000 trials were generated for each combination). Most of these parameters were already discussed in Chapter 3 (Section 3.7). The acceleration factor was not. The choice of acceleration factors depends on the value of design reliability vector $(\underline{r})$. The maximum value of a_f is $\frac{1}{1-r_1}$ and the minimum value is 1 (corresponding to testing under normal use conditions). Effects of accelerated testing can be studied by comparing the behavior of optimal plans with that of optimal plans under normal testing condition.

Table 5.1 Values of the Simulation Experiment Parameters

Parameter	Value(s)
n	1,000
t	2.5, 5
d	5, 10, 50
(k, a)	(3, 10)
g	0.05
f	0.25 $(\underline{u}_a)$, 0.75 $(\underline{u}_b)$, 1.00 $(\underline{u}_c)$
(r_1, r_k)	(0.80, 0.90), (0.90, 0.99)
a_f	1, 2.5, 5 for $\underline{r} = (0.80, 0.85, 0.90)$
	1, 5, 7, 10 for $\underline{r} = (0.900, 0.945, 0.990)$

5. 5 Results and Discussion

Simulation results for a 3-state model allowing accelerated testing at 66 initial probability distributions using $\underline{r} = (0.80,0.85,0.90)$ and (0.900,0.945,0.990) are summarized in Tables E.1-E.6 and E.7-E.12 respectively of Appendix E. Tables E.1 through E.12 each have two parts, a and b. Summarized in the first part (a) are: the optimal first action (F), the average numbers of redesigns made $(\overline{D^*})$, and of tests made $(\overline{T^*})$. Summarized in the second part (b) are: the average growths of probability at the best design reliability state $(\overline{s_3 - s_{03}})$, of the expected reliability $(\overline{r(\underline{s}) - r(\underline{s}_0)})$, and of expected number of effective systems $(\overline{V^* - V_0})$ from before to after using a development program. Those are shown for 3 different acceleration factors.

In general, acceleration of testing does affect the behavior of optimal development programs. The effects are positive, since the accelerated testing provides timely and useful reliability information for design improvement. In our high reliability cases, expected returns under accelerated testing were always higher than expected returns under the normal use testing conditions. We also found that in the cases we studied, the higher the acceleration factor, the stronger the positive effects. The optimal plans under acceleration are intuitively more practical and reasonable than without acceleration. Optimal plans change from employing only redesign, repeated redesign or immediate build to using a mixed sequence of tests and redesigns. Moreover, optimal first actions of some optimal plans change from build or redesign to test.

Tables 5.2-5.3 (for $\underline{r} = (0.80, 0.85, 0.90)$) and Tables 5.4-5.6 (for $\underline{r} = (0.900, 0.945, 0.990)$) summarize numbers of cases (at 66 initial probability distributions $\underline{s}_0$) affected by accelerated testing. If some optimal plans are affected (changed by the use of $a_f > 1$), the differences (I) between expected optimal returns under accelerated testing and normal use conditions testing are summarized. (As in our other simulations, 25,000 runs were made for each case.)

Table 5.2 shows how the behavior of optimal plans is affected by using the maximum possible acceleration factor at different levels of redesign costs. The number of optimal plans affected decreases as the redesign cost (d) increases. This implies that accelerated testing is less effective as the redesign cost increases. Even more informative testing alone is not beneficial, if redesign cannot be economically made after testing. When the redesign cost is high, one is pushed toward an initial "build" action.

Table 5.3 shows how the behavior of optimal plans is affected by using the maximum possible acceleration factor for three different redesign transition matrices. Most of the optimal plans are affected when redesign transition matrix is $\underline{u}_b (g = 0.05, f = 0.75)$, a redesign transition matrix describing moderately effective redesigns. Accelerated testing has almost no effect when redesigns are highly effective (for the matrix $\underline{u}_c$, redesign always improves system reliability). When redesign is highly effective, redesign always dominates the effect of (even accelerated) testing. Accelerated testing has less effect on the optimal plans for $\underline{u}_a (g = 0.05, f = 0.25)$ than for $\underline{u}_b (g = 0.05, f = 0.75)$, because the redesign transition matrix $\underline{u}_a$ describes the least effective redesign mechanism. For this case redesign is rarely an optimal activity and (accelerated) testing is not called for either, since testing alone is not beneficial if it is not followed by effective redesign.

Table 5.2: Results for 66 Distributions $\underline{s}_0$ and the Set of Parameters: $n = 1000$, $t = 5$, $\underline{u}_b(g = 0.05, f = 0.75)$, $\underline{r} = (0.80, 0.85, 0.90)$, and $a_f = 5$ (the maximum possible)

	Numbers of Cases		
	$d = 5$	$d = 10$	$d = 50$
Unchanged Optimal Plans	10 (15.15%)	27 (40.91%)	66 (100%)
Changed Optimal Plans	56 (84.85%)	39 (59.09%)	0 (0%)
with $0 < I \leq 5$	51	37	0
with $5 < I \leq 10$	5	2	0

(I is the increase in the mean numbers of effective systems produced by acceleration.)

Table 5.3: Results for 66 Distributions $\underline{s}_0$ and the Set of Parameters: $n = 1000$, $g = 0.05$ $t = 2.5, d = 5$, $\underline{r} = (0.80, 0.85, 0.90)$, and $a_f = 5$ (the maximum possible)

	Numbers of Cases		
	$\underline{u}_a(f = 0.25)$	$\underline{u}_b(f = 0.75)$	$\underline{u}_c(f = 1.00)$
Unchanged Optimal Plans	41 (62.12%)	4 (6.06%)	62 (93.94%)
Changed Optimal Plans	25 (37.88%)	62 (93.94%)	4 (6.06%)
with $0 < I \leq 5$	8	5	4
with $5 < I \leq 10$	7	29	0
with $10 < I \leq 15$	10	25	0
with $15 < I \leq 20$	0	3	0

(I is the increase in the mean numbers of effective systems produced by acceleration.)

Tables 5.4 and 5.5 summarize results for the cases of even higher design reliabilities namely $\underline{r} = (0.900, 0.945, 0.990)$. They summarize results qualitatively similar to those for $\underline{r} = (0.80, 0.85, 0.90)$ in Tables 5.2 and 5.3

Table 5.6 shows how the behavior of optimal plans is affected the acceleration factor. The number of optimal plans affected and performance measures increase as the acceleration factor increases. This is intuitively appealing because testing under high acceleration provides more informative reliability information.

Table 5.4: Results for 66 Distributions $\underline{s}_0$ and the Set of Parameters: $n = 1{,}000$
$t = 5$, $\underline{u}_b(g = 0.05, f = 0.75)$, $\underline{r} = (0.900, 0.945, 0.990)$, and
$a_f = 10$ (the maximum possible)

	Number of Cases		
	$d = 5$	$d = 10$	$d = 50$
Unchanged Optimal Plans	5 (7.58%)	10 (12.12%)	66 (100%)
Changed Optimal Plans	61 (92.42%)	58 (87.88%)	0 (0%)
with $0 < I \le 5$	5	10	0
with $5 < I \le 10$	45	42	0
with $10 < I \le 15$	11	6	0

(I is the increase in the mean numbers of effective systems produced by acceleration.)

Table 5.5: Results for 66 Distributions $\underline{s}_0$ and for the Set of Parameters: $n = 1000$, $t = 2.5, d = 5$, $\underline{r} = (0.900, 0.945, 0.990)$ and $a_f = 10$ (the maximum possible)

	Number of Cases		
	$\underline{u}_a(g = 0.05, f = 0.25)$,	$\underline{u}_b(g = 0.05, f = 0.75)$,	$\underline{u}_c(g = 0.05, f = 1.00)$,
Unchanged Optimal plans	21 (31.82%)	3 (4.55%)	57 (86.36%)
Changed Optimal Plans	45 (68.18%)	63 (95.45%)	9 (13.64%)
with $0 < I \leq 5$	12	4	9
with $5 < I \leq 10$	12	6	0
with $10 < I \leq 15$	6	48	0
with $15 < I \leq 20$	8	5	0
with $20 < I \leq 25$	7	0	0

(I is the increase in the mean numbers of effective systems produced by acceleration.)

Table 5.6: Results for 66 Distributions $\underline{s}_0$ and for the Set of Parameters: $n = 1000$, $t = 2.5, d = 5$, and $\underline{r} = (0.900, 0.945, 0.990)$

	Number of Cases	
	$a_f = 7$	$a_f = 10$ (the maximum possible)
Unchanged Optimal Plans	5 (7.57%)	3 (4.55%)
Changed Optimal Plans	61 (92.43%)	63 (95.45%)
with $0 < I \leq 5$	7	4
with $5 < I \leq 10$	51	6
with $10 < I \leq 15$	3	48
with $15 < I \leq 20$	0	5

(I is the increase in the mean numbers of effective systems produced by acceleration.)

CHAPTER 6. CONCLUSION AND FUTURE RESEACH

The purpose of our study has been to identify optimal development programs for one-shot systems with the goal of attaining high final design reliability while spending as little of a fixed budget as possible. Our model is an extension of the 2-state model of Moon, Vardeman, and McBeth [1999]. We generalized their theories and analyses to cover any "finite" number of design reliability states. A model using a larger number of design reliability states provides the possibility of more refined modeling, but computing time increases exponentially with the number of states. Choosing a larger number of reliability states also requires more initial inputs (the more detailed initial probability distribution for the states and the set of design reliabilities), which may be difficult and costly to determine objectively. Therefore users need to choose an appropriate number of design reliability states for their particular applications.

Most of our analyses have been done for 3-state reliability models. We studied a total of 7,128 of optimal plans for 3-state models and investigated how the factors, 1) the test cost, 2) the redesign cost, 3) the design reliability vector, 4) the redesign transition matrix, and 5) the initial probability for the states, affect the behavior of development plans. We also did some examples for 4- and 5-state models to show that our model and analysis is capable of handling models with more design reliability states and to find the relationship between computing time and number of design reliability states.

The initial analyses of 3-state cases were presented in 3 main sections, where elements of the design reliability vectors are low, high and mixed. In all 3 sections, the factors: 1) the test cost, 2) the redesign cost, 3) the redesign transition matrix, and 4) the initial probability distribution for the states, all have intuitively plausible effects on the behavior of optimal plans. These are the findings.

1) Optimal development programs providing large number of effective systems can be obtained, if testing is "not expensive" and can provide "informative" results for discriminating among reliability states and redesign uses the information to correct system faults "effectively."

2) The initial probability distribution over states describes developers' beliefs about the initial likelihood of being at each design reliability state and influences what are good development strategies. Typically, if the relative expected reliability is very low, a first development activity is redesign and a development program has a large development cost. If the relative expected reliability is very high, a first activity is build because there is high confidence that current design reliability is large.

We also investigated how the design reliability vector $\underline{r}$ affects the behavior of 3-state optimal plans and these are the findings.

1) Optimal programs for low design reliability employ more development resources (more tests and redesigns) than optimal programs for high design reliability.

2) The behavior of optimal programs for ultra high design reliability is "unusual" in that optimal plans for all of 495 such cases considered involve no testing.

The unique and intuitively unappealing behavior of the development programs for ultra high design reliability problem inspired us to modify our model. Since design reliability is very high for all states, testing under normal use conditions is not beneficial because it does not produce useful information for discriminating between states. Thus we considered the possibility of accelerated testing, where test failure probabilities for each state are a fixed multiple of design failure probabilities under conditions of normal use. Most of the analysis and theory for the general k-state model carried over without modification to the model allowing accelerated testing.

Simulation results for 8,316 parameter combinations in the model allowing accelerated testing are promising. Testing is part of some optimal plans. The accelerated testing has "positive" consequences such as producing more appealing optimal plans, improving performance measures, changing the first optimal development activity and increasing the number of tests and redesigns made by optimal plans. We also find that the larger the acceleration factor used, the stronger the positive effects on optimal plans. (The maximum possible acceleration factor is $\frac{1}{1-r_1}$.) But accelerated testing alone is not beneficial if redesign is not effective. "Therefore to obtain a large optimal return, we need both informative testing providing useful information on current design reliability and effective redesign that uses this information to correct system faults."

Once we determine appropriate acceleration factors that theoretically provide high optimal returns and reasonable development plan behavior, users must determine how to link the desire acceleration constants to a real physical test strategy. Physical mechanisms like increased temperature, voltage, or pressure that increase failure probabilities must be identified and their effects accurately quantified.

Even if we achieve all of our current research goals, there are further issues that can be addressed to improve our analyses in the future. Among these are the following.

1) In our current analyses we used a simple stationary Markov chain transition mechanism to describe the effects of redesign. The single redesign transition matrix has constant effects even if in reality designers could, for example, gain experience over time or if it might be very difficult to redesign effectively late in a development program. The effects of redesign might be better described using dynamic redesign transition matrices. They might change over time, with the number of redesigns made, the average design reliability, or according to the specified type of design flaw identified in testing.
2) The cost of redesign in the current analysis is constant. But there are different types of design problems, which need different corrective actions. Therefore cost of redesign might in reality not be constant. It is then potentially more realistic to describe it as a function of time, the type of redesign transition matrix applied, or the current distribution over design reliability states.
3) Testing used in our work provides only Bernoulli results: pass or fail. These may fail to be informative enough. Other probability distributions might be used to describe test results. Poisson, Normal, or Gamma distributions might be employed (with "test failure" defined in terms of such a variable).
4) Testing under accelerated conditions may consume more resources than testing under normal use conditions and accelerated testing costs should perhaps increase with the acceleration factor. In our present analyses, we used a test cost constant in a_f. It might be more realistic to consider models where the test cost is a function of the acceleration factor.

APPENDIX A. TRANSITION MATRICES DESCRIBING EFFECTS OF REDESIGNS

This Appendix contains the transition matrices $\underline{u}$ used in our simulations.

For $k = 3$ cases:

$\underline{u}_a$			$\underline{u}_b$		
$g = 0.05$ & $f = 0.25$			$g = 0.05$ & $f = 0.75$		
0.7625	0.1188	0.1188	0.2875	0.3563	0.3563
0.7125	0.0500	0.2375	0.2375	0.0500	0.7125
0.3563	0.3563	0.2875	0.1188	0.1188	0.7625

$\underline{u}_c$			$\underline{u}_d$		
$g = 0.05$ & $f = 1.00$			$g = 0.50$ & $f = 1.00$		
0.4750	0.1875	0.1875	0.5000	0.2500	0.2500
0.9500	0.5000	0.3750	0.0000	0.5000	0.5000
1.0000	0.0625	0.8750	0.0000	0.0000	1.0000

For $k = 4$ cases:

$g = 0.05$ & $f = 0.25$				$g = 0.05$ & $f = 0.75$			
0.7625	0.0792	0.0792	0.0792	0.2875	0.2375	0.2375	0.2375
0.7125	0.0500	0.1188	0.1188	0.2375	0.0500	0.3563	0.3563
0.3563	0.3563	0.0500	0.2375	0.1188	0.1188	0.0500	0.7125
0.2375	0.2375	0.2375	0.2875	0.0792	0.0792	0.0792	0.7625

$g = 0.05$ & $f = 1.00$				$g = 0.50$ & $f = 1.00$			
0.0500	0.3167	0.3167	0.3167	0.5000	0.1667	0.1667	0.1667
0.0000	0.0500	0.4750	0.4750	0.0000	0.5000	0.2500	0.2500
0.0000	0.0000	0.0500	0.9500	0.0000	0.0000	0.5000	0.5000
0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	1.0000

For $k = 5$ cases:

$g = 0.05$ & $f = 0.25$					$g = 0.05$ & $f = 0.75$				
0.7625	0.0594	0.0594	0.0594	0.0594	0.28750	0.1781	0.1781	0.1781	0.1781
0.7125	0.0500	0.0792	0.0792	0.0792	0.2375	0.0500	0.2375	0.2375	0.2375
0.3563	0.3563	0.0500	0.1188	0.1188	0.1188	0.1188	0.0500	0.3563	0.3563
0.2375	0.2375	0.2375	0.0500	0.2375	0.0792	0.0792	0.0792	0.0500	0.7125
0.1781	0.1781	0.1781	0.1781	0.2875	0.0594	0.0594	0.0594	0.0594	0.7625

$g = 0.05$ & $f = 1.00$					$g = 0.50$ & $f = 1.00$				
0.0500	0.2375	0.2375	0.2375	0.2375	0.5000	0.1250	0.1250	0.1250	0.1250
0.0000	0.0500	0.3167	0.3167	0.3167	0.0000	0.5000	0.1667	0.1667	0.1667
0.0000	0.0000	0.0500	0.4750	0.4750	0.0000	0.0000	0.5000	0.2500	0.2500
0.0000	0.0000	0.0000	0.0500	0.9500	0.0000	0.0000	0.0000	0.5000	0.5000
0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000

APPENDIX B. COPUTATIONAL DETAILS

APPENDIX B.1 THE INTERPOLATION METHOD

Interpolation is needed during the process of recursively determining expected returns, $V_n(\underline{s})$, where at budget size of n and probability vector $\underline{s}$ an updated probability distribution $(\underline{s}')$ does not match exactly any point on the available grid of probability vectors.

We use multidimensional linear interpolation because "this method is frequently close enough for government work" [Press et al., 1992] and "it is adequate for most engineering applications" [Ayyub and McCuen, 1996]. We can hope that it will often be very accurate in our application, since Proposition 10 says that $V_n(\underline{s})$ is piecewise linear. The following is a complete description of our method for the $k = 3$ case. (Details for larger k are similar.)

Let $V_n(\underline{s})$ be a value to be interpolated. Write $\underline{s} = (s_1, s_2, s_3)$ and think of $V_n(\underline{s})$ as a function of s_2 and s_3 and already evaluated for those $\underline{s}$ where entries of $\underline{s}$ are multiples of $\frac{1}{a}$. Let

$$pt_2 = s_2 \cdot a,$$

and

$$pt_3 = s_3 \cdot a.$$

Define both pt_2^- and pt_2^+ as pt_2 if pt_2 is an integer, and as the two consecutive integers with $pt_2^- \le pt_2 \le pt_2^+$ if pt_2 is not an integer. Similarly define pt_3^- and pt_3^+.

- If $pt_2^+ + pt_3^+ \leq a$

$$\text{Interp}\left[V_n(s_2,s_3)\right] = (1-f_u)\cdot(1-f_v)\cdot V_n(\frac{pt_2^-}{a},\frac{pt_3^-}{a}) + (f_u)\cdot(1-f_v)\cdot V_n(\frac{pt_2^+}{a},\frac{pt_3^-}{a})$$
$$+(1-f_u)\cdot(f_v)\cdot V_n(\frac{pt_2^-}{a},\frac{pt_3^+}{a}) + (f_u)\cdot(f_v)\cdot V_n(\frac{pt_2^+}{a},\frac{pt_3^+}{a}),$$

where

$f_u = 0$, if $pt_2^- = pt_2^+$ and otherwise $f_u = \dfrac{pt_2 - pt_2^-}{pt_2^+ - pt_2^-}$,

and

$f_v = 0$, if $pt_3^+ = pt_3^-$ and otherwise $f_v = \dfrac{pt_3 - pt_3^-}{pt_3^+ - pt_3^-}$.

- If $pt_2^+ + pt_3^+ > a$,

$$\text{Interp}\left[V_n(s_2,s_3)\right] = [1-(pt_2 - pt_2^-)-(pt_3 - pt_3^-)]\cdot V_n(\frac{pt_2^-}{a},\frac{pt_3^-}{a}) +$$
$$(pt_2 - pt_2^-)\cdot V_n(\frac{pt_2^+}{a},\frac{pt_3^-}{a}) + (pt_3 - pt_3^-)\cdot V_n(\frac{pt_2^-}{a},\frac{pt_3^+}{a}).$$

APPENDIX B.2 THE PROCEDURE FOR SIMULATING AN INITIAL REALIABILITY STATE

Let RANU( ) be the Uniform random number generator described in Appendix C.

If RANU( ) $\leq s_{10}$	state (initial) = 1
else if RANU( ) $\leq s_{10} + s_{20}$	state (initial) = 2
$\vdots$	
else if RANU( ) $\leq s_{10} + s_{20} + \ldots + s_{(k-1)0}$	state (initial) = $k - 1$
else	state (initial) = k

APPENDIX B.3 THE PROCEDURE FOR SUMLUATING TRANSITIONS AMONG RELIABLITY STATES

Let RANU( ) be the Uniform random number generator described in Appendix C.

If ($state_c = 1$)

if (RANU ( ) $\leq u_{11}$), $state_c' = 1$

else if (RANU ( ) $\leq u_{11} + u_{12}$), $state_c' = 2$

⋮

else $state_c' = k$.

If ($state_c = 2$)

if (RANU ( ) $\leq u_{11}$), $state_c' = 1$

else if (RANU ( ) $\leq u_{21} + u_{22}$), $state_c' = 2$

⋮

else $state_c' = k$.

⋮

If ($state_c = k$)

if (RANU ( ) $\leq u_{k1}$) $state_c' = 1$

else if (RANU ( ) $\leq u_{k1} + u_{k2}$) $state_c' = 2$

⋮

else $state_c' = k$.

APPENDIX B.4 THE PROCEDURE FOR SUMULATING TEST RESULTS

Let RANU( ) be the Uniform random number generator described in Appendix C.

If ($state_c = 1$)

if (RANU ( ) $\leq (1 - r_1)$),	the test is passed
else	the test is failed.

If ($state_c = 2$)

if (RANU ( ) $\leq (1 - r_2)$),	the test is passed
else	the test is failed.

⋮

If ($state_c = k$)

if (RANU ( ) $\leq (1 - r_k)$),	the test is passed
else	the test is failed.

APPENDIX C. THE UNIFORM RANDOM NUMBER GENERATOR

Uniform [0,1] random numbers are needed in our simulations for generating test results and choosing current reliability states. To get accurate results from simulations, we need a good generator. Mixed generators recommended by L'Ecuyer [1988] combine two different sequences with different periods and add the shuffling algorithm of Bays-Durham as described in Knuth [1981]. The 2 generators used in this algorithm employ

$$m_1 = 2{,}147{,}483{,}563 \text{ (with } a_1 = 40{,}014,\ q_1 = 53{,}668, \text{ and } r_1 = 12{,}211),$$

and

$$m_2 = 2{,}147{,}483{,}399 \text{ (with } a_2 = 40{,}692,\ q_2 = 52{,}774, \text{ and } r_2 = 3{,}791).$$

These constants are used in the recursion

$$z_{i+1} = a\, z_i \bmod m = \begin{cases} a(z_i \bmod q)\ r\left\lfloor \dfrac{z_i}{q} \right\rfloor, & \text{if this is positive,} \\ a(z_i \bmod q)\ r\left\lfloor \dfrac{z_i}{q} \right\rfloor + m, & \text{otherwise.} \end{cases}$$

This algorithm is recommended by Press et. al [1992] because: 1) it produces a large number of random numbers (2.3×10^{18}) before repeating itself, 2) it is fast , 3) it does not require much storage, 4) it is easy to reproduce a given sequence of numbers, and 5) it passes all tests commonly applied to pseudo random number generators such as the uniformity test, the runs-up test, and correlation tests. [Law and Kelton, 1991].

APPENDIX D. SIMULATION RESULTS FOR 3-STATE MODELS

Table D.1: $\underline{u}_a(g = 0.05, f = 0.25), t = 5, d = 5$, and $\underline{r} = (0.10, 0.50, 0.90))$

Table D.2: $\underline{u}_b(g = 0.05, f = 0.75), t = 5, d = 5$, and $\underline{r} = (0.10, 0.50, 0.90))$

Table D.3: $\underline{u}_a(g = 0.05, f = 0.25), t = 5, d = 5$, and $\underline{r} = (0.10, 0.30, 0.50))$

Table D.4: $\underline{u}_b(g = 0.05, f = 0.75), t = 5, d = 5$, and $\underline{r} = (0.10, 0.30, 0.50))$

Table D.5: $\underline{u}_a(g = 0.05, f = 0.25), t = 5, d = 5$, and $\underline{r} = (0.80, 0.85, 0.90))$

Table D.6: $\underline{u}_b(g = 0.05, f = 0.75), t = 5, d = 5$, and $\underline{r} = (0.80, 0.85, 0.90))$

Table D.1a: Simulation Results for the Set of Parameters: $n = 1{,}000$, $t = 5, d = 5$, $\underline{u}_a(g = 0.05, f = 0.25)$, and $\underline{r} = (0.10, 0.50, 0.90)$

s_{01}	s_{02}	s_{03}	$\overline{s_1^*}$	$\overline{s_2^*}$	$\overline{s_3^*}$	$r(\underline{s}_0)$	$\overline{r(\underline{s}^*)}$	V_0	$\overline{V^*}$	$\lfloor \overline{B^*} \rfloor$	$\overline{D^*}$	$\overline{T^*}$
1.00	0.00	0.00	0.000	0.055	0.945	0.100	0.878	100.00	770.15	876.81	8.62	16.02
0.90	0.00	0.10	0.000	0.050	0.949	0.180	0.880	180.00	775.85	881.41	7.77	15.95
0.80	0.00	0.20	0.001	0.045	0.954	0.260	0.881	260.00	787.13	892.73	6.94	14.51
0.70	0.00	0.30	0.001	0.040	0.959	0.340	0.883	340.00	798.22	903.09	6.15	13.23
0.60	0.00	0.40	0.001	0.033	0.966	0.420	0.886	420.00	809.13	912.41	5.11	12.41
0.50	0.00	0.50	0.001	0.028	0.971	0.500	0.888	500.00	821.38	923.85	4.27	10.96
0.40	0.00	0.60	0.005	0.022	0.973	0.580	0.887	580.00	833.93	939.39	3.41	8.72
0.30	0.00	0.70	0.004	0.017	0.979	0.660	0.890	660.00	847.12	950.90	2.59	7.23
0.20	0.00	0.80	0.003	0.012	0.986	0.740	0.893	740.00	860.44	962.60	1.76	5.72
0.10	0.00	0.90	0.001	0.006	0.993	0.820	0.897	820.00	874.80	975.19	0.82	4.14
0.00	0.00	1.00	0.000	0.000	1.000	0.900	0.900	900.00	900.00	1000.00	0.00	0.00
0.90	0.10	0.00	0.000	0.055	0.945	0.140	0.878	140.00	771.13	877.84	8.53	15.90
0.80	0.10	0.10	0.000	0.055	0.945	0.220	0.878	220.00	773.95	881.07	7.70	16.09
0.70	0.10	0.20	0.000	0.053	0.947	0.300	0.878	300.00	783.79	891.73	6.81	14.85
0.60	0.10	0.30	0.000	0.049	0.950	0.380	0.880	380.00	793.38	900.91	6.02	13.80
0.50	0.10	0.40	0.001	0.051	0.948	0.460	0.879	460.00	803.90	914.16	5.18	11.99
0.40	0.10	0.50	0.001	0.046	0.953	0.540	0.881	540.00	814.74	924.25	4.13	11.03
0.30	0.10	0.60	0.000	0.042	0.958	0.620	0.883	620.00	826.20	935.10	3.30	9.68
0.20	0.10	0.70	0.002	0.046	0.952	0.700	0.880	700.00	837.62	951.68	2.33	7.34
0.10	0.10	0.80	0.001	0.043	0.956	0.780	0.882	780.00	850.53	964.15	1.49	5.68
0.00	0.10	0.90	0.000	0.057	0.943	0.860	0.877	860.00	864.54	985.66	0.39	2.48
0.80	0.20	0.00	0.000	0.054	0.946	0.180	0.878	180.00	772.20	878.84	8.46	15.78
0.70	0.20	0.10	0.000	0.054	0.945	0.260	0.878	260.00	772.65	879.41	8.30	15.82
0.60	0.20	0.20	0.000	0.054	0.945	0.340	0.878	340.00	782.08	890.23	6.84	15.11
0.50	0.20	0.30	0.000	0.056	0.944	0.420	0.877	420.00	791.37	901.53	5.91	13.79
0.40	0.20	0.40	0.000	0.051	0.948	0.500	0.879	500.00	800.68	910.17	5.14	12.83
0.30	0.20	0.50	0.000	0.049	0.951	0.580	0.880	580.00	810.11	919.75	4.08	11.97
0.20	0.20	0.60	0.000	0.053	0.946	0.660	0.878	660.00	821.17	934.66	3.17	9.90
0.10	0.20	0.70	0.000	0.049	0.951	0.740	0.880	740.00	832.75	945.91	2.33	8.49
0.00	0.20	0.80	0.000	0.047	0.952	0.820	0.881	820.00	844.21	958.06	1.41	6.97
0.70	0.30	0.00	0.000	0.056	0.944	0.220	0.877	220.00	772.70	880.27	8.34	15.60
0.60	0.30	0.10	0.000	0.054	0.946	0.300	0.878	300.00	773.92	880.60	8.21	15.67
0.50	0.30	0.20	0.000	0.053	0.946	0.380	0.878	380.00	781.12	888.72	6.78	15.48

Table D.1a: (continued)

s_{01}	s_{02}	s_{03}	$\overline{s_1^*}$	$\overline{s_2^*}$	$\overline{s_3^*}$	$r(\underline{s}_0)$	$\overline{r(\underline{s}^*)}$	V_0	$\overline{V^*}$	$\overline{[B^*]}$	$\overline{D^*}$	$\overline{T^*}$
0.40	0.30	0.30	0.000	0.053	0.947	0.460	0.879	460.00	789.92	898.67	5.87	14.40
0.30	0.30	0.40	0.000	0.052	0.948	0.540	0.879	540.00	798.72	908.04	5.10	13.30
0.20	0.30	0.50	0.000	0.054	0.946	0.620	0.878	620.00	807.95	919.79	4.28	11.76
0.10	0.30	0.60	0.000	0.049	0.951	0.700	0.880	700.00	818.40	929.48	3.14	10.97
0.00	0.30	0.70	0.000	0.048	0.952	0.780	0.881	780.00	829.45	941.30	2.26	9.48
0.60	0.40	0.00	0.000	0.055	0.945	0.260	0.878	260.00	774.07	881.45	8.25	15.46
0.50	0.40	0.10	0.000	0.056	0.944	0.340	0.877	340.00	775.19	883.00	8.10	15.30
0.40	0.40	0.20	0.000	0.055	0.944	0.420	0.878	420.00	780.91	889.33	6.71	15.42
0.30	0.40	0.30	0.000	0.052	0.948	0.500	0.879	500.00	789.15	897.40	5.95	14.57
0.20	0.40	0.40	0.000	0.053	0.946	0.580	0.878	580.00	797.76	907.73	5.03	13.43
0.10	0.40	0.50	0.000	0.051	0.949	0.660	0.879	660.00	807.04	917.23	4.19	12.36
0.00	0.40	0.60	0.000	0.056	0.944	0.740	0.878	740.00	816.80	930.50	3.05	10.85
0.50	0.50	0.00	0.000	0.055	0.945	0.300	0.878	300.00	775.44	882.89	8.16	15.26
0.40	0.50	0.10	0.000	0.055	0.945	0.380	0.878	380.00	776.44	884.08	8.02	15.17
0.30	0.50	0.20	0.000	0.053	0.947	0.460	0.879	460.00	781.14	888.66	6.64	15.63
0.20	0.50	0.30	0.000	0.052	0.947	0.540	0.879	540.00	788.89	897.21	5.91	14.65
0.10	0.50	0.40	0.000	0.056	0.944	0.620	0.877	620.00	797.20	908.36	4.90	13.43
0.00	0.50	0.50	0.000	0.052	0.948	0.700	0.879	700.00	806.42	916.99	4.13	12.47
0.40	0.60	0.00	0.000	0.054	0.946	0.340	0.878	340.00	776.76	883.88	8.08	15.14
0.30	0.60	0.10	0.000	0.054	0.946	0.420	0.878	420.00	777.69	885.03	7.94	15.06
0.20	0.60	0.20	0.000	0.053	0.947	0.500	0.879	500.00	781.80	889.29	6.62	15.53
0.10	0.60	0.30	0.000	0.053	0.946	0.580	0.878	580.00	789.00	897.79	5.81	14.64
0.00	0.60	0.40	0.000	0.051	0.948	0.660	0.879	660.00	796.73	905.70	5.07	13.79
0.30	0.70	0.00	0.000	0.053	0.947	0.380	0.879	380.00	778.04	884.87	8.00	15.03
0.20	0.70	0.10	0.000	0.054	0.946	0.460	0.878	460.00	779.14	886.60	7.84	14.84
0.10	0.70	0.20	0.000	0.053	0.947	0.540	0.879	540.00	782.33	889.77	6.54	15.51
0.00	0.70	0.30	0.000	0.055	0.945	0.620	0.878	620.00	788.78	898.14	5.73	14.64
0.20	0.80	0.00	0.000	0.052	0.948	0.420	0.879	420.00	779.48	886.10	7.88	14.90
0.10	0.80	0.10	0.000	0.053	0.947	0.500	0.879	500.00	780.48	887.66	7.75	14.72
0.00	0.80	0.20	0.000	0.054	0.946	0.580	0.878	580.00	781.59	889.38	7.59	14.54
0.10	0.90	0.00	0.001	0.054	0.945	0.460	0.878	460.00	780.77	889.14	7.76	14.41
0.00	0.90	0.10	0.000	0.052	0.948	0.540	0.879	540.00	781.62	888.47	7.66	14.64
0.00	1.00	0.00	0.001	0.052	0.947	0.500	0.878	500.00	782.19	890.05	7.69	14.30

Table D.1b: Simulation Results for the Set of Parameters: $n = 1{,}000$, $t = 5, d = 5$, $\underline{u}_a(g = 0.05, f = 0.25)$, and $\underline{r} = (0.10, 0.50, 0.90)$

s_{01}	s_{02}	s_{03}	F	$\overline{s}_{3grw}$	$\overline{r}_{grw}$	$\overline{V}_{grw}$	$\overline{DevC}$	$\frac{\overline{V}_{grw}}{\overline{DevC}}$	$\frac{\overline{DevC}}{n}\%$	$\overline{\frac{V^*}{V_0}}$
1.00	0.00	0.00	3.0	0.945	0.778	670.15	123.19	5.44	12.32	7.70
0.90	0.00	0.10	2.0	0.849	0.700	595.85	118.59	5.02	11.86	4.31
0.80	0.00	0.20	2.0	0.754	0.621	527.13	107.27	4.91	10.73	3.03
0.70	0.00	0.30	2.0	0.659	0.543	458.22	96.91	4.73	9.69	2.35
0.60	0.00	0.40	2.0	0.566	0.466	389.13	87.59	4.44	8.76	1.93
0.50	0.00	0.50	2.0	0.471	0.388	321.38	76.15	4.22	7.61	1.64
0.40	0.00	0.60	2.0	0.373	0.307	253.93	60.61	4.19	6.06	1.44
0.30	0.00	0.70	2.0	0.279	0.230	187.12	49.10	3.81	4.91	1.28
0.20	0.00	0.80	2.0	0.186	0.153	120.44	37.40	3.22	3.74	1.16
0.10	0.00	0.90	2.0	0.093	0.077	54.80	24.81	2.21	2.48	1.07
0.00	0.00	1.00	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.90	0.10	0.00	3.0	0.945	0.738	631.13	122.16	5.17	12.22	5.51
0.80	0.10	0.10	2.0	0.845	0.658	553.95	118.93	4.66	11.89	3.52
0.70	0.10	0.20	2.0	0.747	0.578	483.79	108.27	4.47	10.83	2.61
0.60	0.10	0.30	2.0	0.650	0.500	413.38	99.09	4.17	9.91	2.09
0.50	0.10	0.40	2.0	0.548	0.419	343.90	85.84	4.01	8.58	1.75
0.40	0.10	0.50	2.0	0.453	0.341	274.74	75.75	3.63	7.58	1.51
0.30	0.10	0.60	2.0	0.358	0.263	206.20	64.90	3.18	6.49	1.33
0.20	0.10	0.70	2.0	0.252	0.180	137.62	48.32	2.85	4.83	1.20
0.10	0.10	0.80	2.0	0.156	0.102	70.53	35.85	1.97	3.59	1.09
0.00	0.10	0.90	2.0	0.043	0.017	4.54	14.34	0.32	1.43	1.01
0.80	0.20	0.00	3.0	0.946	0.698	592.20	121.16	4.89	12.12	4.29
0.70	0.20	0.10	3.0	0.845	0.618	512.65	120.59	4.25	12.06	2.97
0.60	0.20	0.20	2.0	0.745	0.538	442.08	109.77	4.03	10.98	2.30
0.50	0.20	0.30	2.0	0.644	0.457	371.37	98.47	3.77	9.85	1.88
0.40	0.20	0.40	2.0	0.548	0.379	300.68	89.83	3.35	8.98	1.60
0.30	0.20	0.50	2.0	0.451	0.300	230.11	80.25	2.87	8.02	1.40
0.20	0.20	0.60	2.0	0.346	0.218	161.17	65.34	2.47	6.53	1.24
0.10	0.20	0.70	2.0	0.251	0.140	92.75	54.09	1.71	5.41	1.13
0.00	0.20	0.80	2.0	0.152	0.061	24.21	41.94	0.58	4.19	1.03
0.70	0.30	0.00	3.0	0.944	0.657	552.70	119.73	4.62	11.97	3.51
0.60	0.30	0.10	3.0	0.846	0.578	473.92	119.40	3.97	11.94	2.58
0.50	0.30	0.20	2.0	0.746	0.498	401.12	111.28	3.60	11.13	2.06

Table D.1b: (continued)

s_{01}	s_{02}	s_{03}	F	$\bar{s}_{3grw}$	$\bar{r}_{grw}$	$\bar{V}_{grw}$	$\overline{DevC}$	$\frac{\bar{V}_{grw}}{\overline{DevC}}$	$\frac{\overline{DevC}}{n}\%$	$\frac{\overline{V^*}}{V_0}$
0.40	0.30	0.30	2.0	0.647	0.419	329.92	101.33	3.26	10.13	1.72
0.30	0.30	0.40	2.0	0.548	0.339	258.72	91.96	2.81	9.20	1.48
0.20	0.30	0.50	2.0	0.446	0.258	187.95	80.21	2.34	8.02	1.30
0.10	0.30	0.60	2.0	0.351	0.180	118.40	70.52	1.68	7.05	1.17
0.00	0.30	0.70	2.0	0.252	0.101	49.45	58.70	0.84	5.87	1.06
0.60	0.40	0.00	3.0	0.945	0.618	514.07	118.55	4.34	11.86	2.98
0.50	0.40	0.10	3.0	0.844	0.537	435.19	117.00	3.72	11.70	2.28
0.40	0.40	0.20	2.0	0.744	0.458	360.91	110.67	3.26	11.07	1.86
0.30	0.40	0.30	2.0	0.648	0.379	289.15	102.60	2.82	10.26	1.58
0.20	0.40	0.40	2.0	0.546	0.298	217.76	92.27	2.36	9.23	1.38
0.10	0.40	0.50	2.0	0.449	0.219	147.04	82.77	1.78	8.28	1.22
0.00	0.40	0.60	2.0	0.344	0.138	76.80	69.50	1.10	6.95	1.10
0.50	0.50	0.00	3.0	0.945	0.578	475.44	117.11	4.06	11.71	2.58
0.40	0.50	0.10	3.0	0.845	0.498	396.44	115.92	3.42	11.59	2.04
0.30	0.50	0.20	2.0	0.747	0.419	321.14	111.34	2.88	11.13	1.70
0.20	0.50	0.30	2.0	0.647	0.339	248.89	102.79	2.42	10.28	1.46
0.10	0.50	0.40	2.0	0.544	0.257	177.20	91.64	1.93	9.16	1.29
0.00	0.50	0.50	2.0	0.448	0.179	106.42	83.01	1.28	8.30	1.15
0.40	0.60	0.00	3.0	0.946	0.538	436.76	116.12	3.76	11.61	2.28
0.30	0.60	0.10	3.0	0.846	0.458	357.69	114.97	3.11	11.50	1.85
0.20	0.60	0.20	2.0	0.747	0.379	281.80	110.71	2.55	11.07	1.56
0.10	0.60	0.30	2.0	0.646	0.298	209.00	102.21	2.04	10.22	1.36
0.00	0.60	0.40	2.0	0.548	0.219	136.73	94.30	1.45	9.43	1.21
0.30	0.70	0.00	3.0	0.947	0.499	398.04	115.13	3.46	11.51	2.05
0.20	0.70	0.10	3.0	0.846	0.418	319.14	113.40	2.81	11.34	1.69
0.10	0.70	0.20	2.0	0.747	0.339	242.33	110.23	2.20	11.02	1.45
0.00	0.70	0.30	2.0	0.645	0.258	168.78	101.86	1.66	10.19	1.27
0.20	0.80	0.00	3.0	0.948	0.459	359.48	113.90	3.16	11.39	1.86
0.10	0.80	0.10	3.0	0.847	0.379	280.48	112.34	2.50	11.23	1.56
0.00	0.80	0.20	3.0	0.746	0.298	201.59	110.62	1.82	11.06	1.35
0.10	0.90	0.00	3.0	0.945	0.418	320.77	110.86	2.89	11.09	1.70
0.00	0.90	0.10	3.0	0.848	0.339	241.62	111.53	2.17	11.15	1.45
0.00	1.00	0.00	3.0	0.947	0.378	282.19	109.95	2.57	11.00	1.56

Table D.1c: Simulation Results for the Set of Parameters: $n = 1{,}000$, $t = 5$, $d = 5$, $\underline{u}_a(g = 0.05, f = 0.25)$, and $\underline{r} = (0.10, 0.50, 0.90)$

s_{01}	s_{02}	s_{03}	SD(s_2^*)	SD(s_3^*)	SD($r(\underline{s}^*)$)	SD(V^*)	Min(B^*)	SD(B^*)	SD(D^*)	SD(T^*)
1.00	0.00	0.00	0.02	0.02	0.01	83.30	125.00	90.98	7.92	10.61
0.90	0.00	0.10	0.02	0.02	0.01	84.49	300.00	90.38	7.83	10.56
0.80	0.00	0.20	0.03	0.02	0.01	86.54	300.00	91.73	7.80	10.83
0.70	0.00	0.30	0.03	0.03	0.01	87.46	300.00	91.40	7.70	10.83
0.60	0.00	0.40	0.03	0.03	0.01	87.95	195.00	90.41	7.40	10.94
0.50	0.00	0.50	0.03	0.03	0.01	84.83	195.00	86.37	7.01	10.49
0.40	0.00	0.60	0.03	0.03	0.01	79.64	195.00	82.65	6.49	10.25
0.30	0.00	0.70	0.03	0.03	0.01	73.71	195.00	75.43	5.85	9.42
0.20	0.00	0.80	0.02	0.02	0.01	63.56	195.00	64.19	4.93	8.07
0.10	0.00	0.90	0.02	0.02	0.01	46.37	345.00	46.33	3.41	6.00
0.00	0.00	1.00	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.90	0.10	0.00	0.02	0.02	0.01	83.35	125.00	90.96	7.91	10.61
0.80	0.10	0.10	0.01	0.02	0.01	81.74	235.00	89.34	7.79	10.41
0.70	0.10	0.20	0.01	0.01	0.01	82.32	300.00	89.93	7.77	10.54
0.60	0.10	0.30	0.02	0.02	0.01	83.28	270.00	89.83	7.68	10.60
0.50	0.10	0.40	0.01	0.01	0.01	80.84	245.00	88.51	7.37	10.60
0.40	0.10	0.50	0.02	0.02	0.01	79.21	125.00	85.49	6.95	10.42
0.30	0.10	0.60	0.02	0.02	0.01	75.32	125.00	80.33	6.45	9.87
0.20	0.10	0.70	0.01	0.01	0.00	66.27	195.00	72.96	5.59	9.28
0.10	0.10	0.80	0.01	0.01	0.00	57.42	195.00	62.35	4.68	8.02
0.00	0.10	0.90	0.00	0.00	0.00	31.56	500.00	35.85	2.35	5.04
0.80	0.20	0.00	0.02	0.02	0.01	83.50	125.00	90.91	7.90	10.60
0.70	0.20	0.10	0.02	0.02	0.01	83.72	195.00	91.28	7.94	10.66
0.60	0.20	0.20	0.01	0.01	0.01	81.48	235.00	89.27	7.75	10.44
0.50	0.20	0.30	0.01	0.01	0.01	80.66	235.00	89.35	7.63	10.57
0.40	0.20	0.40	0.01	0.01	0.01	79.76	245.00	87.10	7.37	10.37
0.30	0.20	0.50	0.01	0.02	0.01	77.73	125.00	84.27	6.94	10.22
0.20	0.20	0.60	0.01	0.01	0.00	72.14	125.00	80.09	6.37	9.97
0.10	0.20	0.70	0.01	0.01	0.00	66.33	195.00	72.76	5.67	9.18
0.00	0.20	0.80	0.01	0.01	0.00	56.13	195.00	61.07	4.53	7.98
0.70	0.30	0.00	0.02	0.02	0.01	83.51	195.00	91.83	7.92	10.77
0.60	0.30	0.10	0.02	0.02	0.01	83.72	195.00	91.05	7.92	10.63
0.50	0.30	0.20	0.02	0.02	0.01	81.66	235.00	89.02	7.77	10.40

Table D.1c: (continued)

s_{01}	s_{02}	s_{03}	SD(s_2^*)	SD(s_3^*)	SD($r(\underline{s}^*)$)	SD(V^*)	Min(B^*)	SD(B^*)	SD(D^*)	SD(T^*)
0.40	0.30	0.30	0.01	0.01	0.01	80.90	235.00	88.54	7.63	10.43
0.30	0.30	0.40	0.01	0.02	0.01	79.26	235.00	86.43	7.37	10.25
0.20	0.30	0.50	0.01	0.01	0.00	75.45	245.00	83.58	6.94	10.11
0.10	0.30	0.60	0.01	0.01	0.01	72.14	195.00	78.77	6.32	9.78
0.00	0.30	0.70	0.01	0.01	0.01	65.16	195.00	70.77	5.53	8.95
0.60	0.40	0.00	0.02	0.02	0.01	83.70	195.00	91.70	7.91	10.75
0.50	0.40	0.10	0.01	0.02	0.01	83.47	195.00	91.79	7.91	10.77
0.40	0.40	0.20	0.01	0.01	0.01	81.22	235.00	89.36	7.76	10.49
0.30	0.40	0.30	0.01	0.02	0.01	80.27	235.00	87.47	7.59	10.27
0.20	0.40	0.40	0.01	0.01	0.01	77.97	235.00	85.62	7.29	10.19
0.10	0.40	0.50	0.01	0.01	0.01	75.21	235.00	82.04	6.88	9.87
0.00	0.40	0.60	0.01	0.01	0.01	69.80	195.00	77.85	6.21	9.70
0.50	0.50	0.00	0.02	0.02	0.01	83.95	195.00	91.87	7.91	10.77
0.40	0.50	0.10	0.02	0.02	0.01	83.81	195.00	91.85	7.91	10.79
0.30	0.50	0.20	0.02	0.02	0.01	81.11	235.00	88.38	7.71	10.37
0.20	0.50	0.30	0.01	0.01	0.01	80.25	235.00	87.58	7.59	10.30
0.10	0.50	0.40	0.01	0.01	0.01	76.64	235.00	85.11	7.20	10.19
0.00	0.50	0.50	0.01	0.01	0.01	74.07	235.00	81.19	6.81	9.78
0.40	0.60	0.00	0.02	0.02	0.01	84.40	195.00	91.95	7.91	10.79
0.30	0.60	0.10	0.02	0.02	0.01	84.00	195.00	91.67	7.88	10.77
0.20	0.60	0.20	0.02	0.02	0.01	81.29	185.00	88.54	7.70	10.40
0.10	0.60	0.30	0.01	0.01	0.01	79.45	235.00	87.08	7.50	10.30
0.00	0.60	0.40	0.01	0.02	0.01	77.94	235.00	84.85	7.27	10.06
0.30	0.70	0.00	0.02	0.02	0.01	84.62	195.00	91.78	7.89	10.77
0.20	0.70	0.10	0.02	0.02	0.01	83.93	195.00	91.53	7.86	10.76
0.10	0.70	0.20	0.02	0.02	0.01	81.23	125.00	88.42	7.68	10.39
0.00	0.70	0.30	0.02	0.02	0.01	79.65	235.00	87.68	7.51	10.40
0.20	0.80	0.00	0.02	0.02	0.01	84.53	195.00	91.32	7.85	10.73
0.10	0.80	0.10	0.02	0.02	0.01	84.08	195.00	91.32	7.84	10.73
0.00	0.80	0.20	0.02	0.02	0.01	83.43	195.00	91.08	7.81	10.71
0.10	0.90	0.00	0.02	0.02	0.01	83.87	195.00	92.19	7.82	10.92
0.00	0.90	0.10	0.02	0.02	0.01	84.28	195.00	91.11	7.81	10.72
0.00	1.00	0.00	0.02	0.02	0.01	84.45	195.00	92.20	7.81	10.93

Table D.2a: Simulation Results for the Set of Parameters: $n = 1{,}000$, $t = 5, d = 5$, $\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.10, 0.50, 0.90)$

s_{01}	s_{02}	s_{03}	$\overline{s_1^*}$	$\overline{s_2^*}$	$\overline{s_3^*}$	$r(\underline{s}_0)$	$\overline{r(\underline{s}^*)}$	V_0	$\overline{V^*}$	$\lfloor B^* \rfloor$	$\overline{D^*}$	$\overline{T^*}$
1.00	0.00	0.00	0.000	0.039	0.960	0.100	0.884	100.00	848.01	959.32	3.56	4.58
0.90	0.00	0.10	0.000	0.039	0.961	0.180	0.884	180.00	848.41	959.54	3.53	4.56
0.80	0.00	0.20	0.001	0.032	0.967	0.260	0.886	260.00	849.79	958.82	2.87	5.37
0.70	0.00	0.30	0.001	0.028	0.971	0.340	0.888	340.00	853.78	961.55	2.54	5.15
0.60	0.00	0.40	0.001	0.025	0.974	0.420	0.889	420.00	857.63	964.21	2.23	4.93
0.50	0.00	0.50	0.001	0.021	0.978	0.500	0.891	500.00	861.44	966.84	1.91	4.72
0.40	0.00	0.60	0.005	0.017	0.978	0.580	0.889	580.00	865.37	973.00	1.59	3.81
0.30	0.00	0.70	0.004	0.012	0.985	0.660	0.892	660.00	870.62	975.59	1.07	3.81
0.20	0.00	0.80	0.003	0.008	0.990	0.740	0.895	740.00	876.37	979.30	0.74	3.40
0.10	0.00	0.90	0.001	0.004	0.995	0.820	0.897	820.00	882.46	983.39	0.38	2.94
0.00	0.00	1.00	0.000	0.000	1.000	0.900	0.900	900.00	900.00	1000.00	0.00	0.00
0.90	0.10	0.00	0.000	0.039	0.960	0.140	0.884	140.00	848.10	959.42	3.55	4.57
0.80	0.10	0.10	0.000	0.039	0.961	0.220	0.884	220.00	848.50	959.63	3.52	4.55
0.70	0.10	0.20	0.000	0.038	0.961	0.300	0.884	300.00	848.78	959.77	3.43	4.61
0.60	0.10	0.30	0.000	0.038	0.962	0.380	0.885	380.00	849.16	959.94	3.41	4.60
0.50	0.10	0.40	0.000	0.033	0.966	0.460	0.886	460.00	851.81	961.00	2.29	5.52
0.40	0.10	0.50	0.001	0.035	0.964	0.540	0.885	540.00	855.17	965.94	1.92	4.89
0.30	0.10	0.60	0.000	0.034	0.966	0.620	0.886	620.00	858.60	968.85	1.63	4.60
0.20	0.10	0.70	0.000	0.030	0.970	0.700	0.888	700.00	862.16	971.22	1.32	4.44
0.10	0.10	0.80	0.001	0.036	0.963	0.780	0.885	780.00	865.91	978.70	0.73	3.53
0.00	0.10	0.90	0.000	0.032	0.968	0.860	0.887	860.00	871.77	982.69	0.41	3.05
0.80	0.20	0.00	0.000	0.039	0.960	0.180	0.884	180.00	848.19	959.51	3.53	4.56
0.70	0.20	0.10	0.000	0.039	0.961	0.260	0.884	260.00	848.58	959.71	3.51	4.55
0.60	0.20	0.20	0.000	0.038	0.961	0.340	0.884	340.00	848.87	959.86	3.42	4.61
0.50	0.20	0.30	0.000	0.038	0.962	0.420	0.885	420.00	849.25	960.03	3.40	4.59
0.40	0.20	0.40	0.000	0.034	0.966	0.500	0.886	500.00	850.39	959.38	2.73	5.40
0.30	0.20	0.50	0.000	0.037	0.963	0.580	0.885	580.00	852.41	962.99	1.94	5.46
0.20	0.20	0.60	0.000	0.033	0.967	0.660	0.887	660.00	855.30	964.76	1.68	5.37
0.10	0.20	0.70	0.000	0.029	0.971	0.740	0.888	740.00	858.65	966.74	1.20	5.45
0.00	0.20	0.80	0.000	0.036	0.964	0.820	0.886	820.00	863.04	974.46	0.85	4.26
0.70	0.30	0.00	0.000	0.039	0.960	0.220	0.884	220.00	848.27	959.58	3.52	4.56
0.60	0.30	0.10	0.000	0.039	0.961	0.300	0.884	300.00	848.68	959.80	3.50	4.54
0.50	0.30	0.20	0.000	0.038	0.961	0.380	0.884	380.00	848.96	959.94	3.41	4.60

Table D.2a: (continued)

s_{01}	s_{02}	s_{03}	$\overline{s_1^*}$	$\overline{s_2^*}$	$\overline{s_3^*}$	$r(\underline{s}_0)$	$\overline{r(\underline{s}^*)}$	V_0	$\overline{V^*}$	$\lfloor B^* \rfloor$	$\overline{D^*}$	$\overline{T^*}$
0.40	0.30	0.30	0.000	0.033	0.966	0.460	0.886	460.00	850.38	959.28	2.75	5.40
0.30	0.30	0.40	0.000	0.031	0.968	0.540	0.887	540.00	852.01	960.21	2.61	5.34
0.20	0.30	0.50	0.000	0.036	0.964	0.620	0.885	620.00	854.16	964.82	2.40	4.64
0.10	0.30	0.60	0.000	0.033	0.967	0.700	0.887	700.00	856.67	966.11	2.30	4.48
0.00	0.30	0.70	0.000	0.028	0.972	0.780	0.889	780.00	859.23	966.96	2.09	4.51
0.60	0.40	0.00	0.000	0.039	0.960	0.260	0.884	260.00	848.36	959.67	3.51	4.55
0.50	0.40	0.10	0.000	0.036	0.964	0.340	0.885	340.00	848.72	958.48	2.86	5.44
0.40	0.40	0.20	0.000	0.033	0.967	0.420	0.887	420.00	850.37	959.18	2.77	5.40
0.30	0.40	0.30	0.000	0.031	0.969	0.500	0.887	500.00	852.04	960.10	2.66	5.32
0.20	0.40	0.40	0.000	0.035	0.964	0.580	0.886	580.00	854.28	964.70	2.42	4.64
0.10	0.40	0.50	0.000	0.032	0.968	0.660	0.887	660.00	856.78	965.95	2.32	4.49
0.00	0.40	0.60	0.000	0.027	0.972	0.740	0.889	740.00	859.37	966.76	2.12	4.53
0.50	0.50	0.00	0.000	0.036	0.964	0.300	0.886	300.00	848.70	958.39	2.88	5.44
0.40	0.50	0.10	0.000	0.034	0.966	0.380	0.886	380.00	850.32	959.27	2.79	5.36
0.30	0.50	0.20	0.000	0.039	0.961	0.460	0.884	460.00	851.98	963.60	2.65	4.63
0.20	0.50	0.30	0.000	0.035	0.965	0.540	0.886	540.00	854.40	964.57	2.44	4.65
0.10	0.50	0.40	0.000	0.031	0.968	0.620	0.887	620.00	856.93	965.83	2.33	4.51
0.00	0.50	0.50	0.000	0.027	0.973	0.700	0.889	700.00	859.56	966.68	2.14	4.53
0.40	0.60	0.00	0.000	0.033	0.966	0.340	0.886	340.00	850.31	959.17	2.81	5.36
0.30	0.60	0.10	0.000	0.038	0.961	0.420	0.884	420.00	852.04	963.49	2.59	4.71
0.20	0.60	0.20	0.000	0.034	0.965	0.500	0.886	500.00	854.49	964.41	2.46	4.66
0.10	0.60	0.30	0.000	0.031	0.969	0.580	0.887	580.00	857.06	965.69	2.35	4.52
0.00	0.60	0.40	0.000	0.026	0.974	0.660	0.889	660.00	859.76	966.55	2.16	4.53
0.30	0.70	0.00	0.000	0.038	0.962	0.380	0.885	380.00	852.15	963.34	2.61	4.72
0.20	0.70	0.10	0.000	0.034	0.966	0.460	0.886	460.00	854.57	964.23	2.48	4.67
0.10	0.70	0.20	0.000	0.030	0.970	0.540	0.888	540.00	857.17	965.51	2.37	4.53
0.00	0.70	0.30	0.002	0.032	0.966	0.620	0.886	620.00	860.13	971.27	2.14	3.61
0.20	0.80	0.00	0.000	0.034	0.966	0.420	0.886	420.00	854.68	964.41	2.50	4.61
0.10	0.80	0.10	0.000	0.029	0.971	0.500	0.888	500.00	857.30	965.24	2.32	4.63
0.00	0.80	0.20	0.002	0.031	0.967	0.580	0.886	580.00	860.53	971.51	2.15	3.55
0.10	0.90	0.00	0.000	0.028	0.972	0.460	0.888	460.00	857.50	965.11	2.35	4.63
0.00	0.90	0.10	0.002	0.029	0.968	0.540	0.886	540.00	860.86	971.24	2.18	3.57
0.00	1.00	0.00	0.003	0.028	0.970	0.500	0.887	500.00	861.23	971.02	2.21	3.59

Table D.2b: Simulation Results for the Set of Parameters: $n = 1{,}000$, $t = 5, d = 5$, $\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.10, 0.50, 0.90)$

s_{01}	s_{02}	s_{03}	F	$\overline{s}_{3grw}$	$\overline{r}_{grw}$	$\overline{V}_{grw}$	$\overline{DevC}$	$\frac{\overline{V}_{grw}}{\overline{DevC}}$	$\frac{\overline{DevC}}{n}\%$	$\frac{\overline{V^*}}{V_0}$
1.00	0.00	0.00	3.0	0.960	0.784	748.01	40.68	18.39	4.07	8.48
0.90	0.00	0.10	3.0	0.861	0.704	668.41	40.46	16.52	4.05	4.71
0.80	0.00	0.20	2.0	0.767	0.626	589.79	41.18	14.32	4.12	3.27
0.70	0.00	0.30	2.0	0.671	0.548	513.78	38.45	13.36	3.85	2.51
0.60	0.00	0.40	2.0	0.574	0.469	437.63	35.79	12.23	3.58	2.04
0.50	0.00	0.50	2.0	0.478	0.391	361.44	33.16	10.90	3.32	1.72
0.40	0.00	0.60	2.0	0.378	0.309	285.37	27.00	10.57	2.70	1.49
0.30	0.00	0.70	2.0	0.285	0.232	210.62	24.41	8.63	2.44	1.32
0.20	0.00	0.80	2.0	0.190	0.155	136.37	20.70	6.59	2.07	1.18
0.10	0.00	0.90	2.0	0.095	0.077	62.46	16.61	3.76	1.66	1.08
0.00	0.00	1.00	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.90	0.10	0.00	3.0	0.960	0.744	708.10	40.58	17.45	4.06	6.06
0.80	0.10	0.10	3.0	0.861	0.664	628.50	40.37	15.57	4.04	3.86
0.70	0.10	0.20	3.0	0.761	0.584	548.78	40.23	13.64	4.02	2.83
0.60	0.10	0.30	3.0	0.662	0.505	469.16	40.06	11.71	4.01	2.23
0.50	0.10	0.40	2.0	0.566	0.426	391.81	39.00	10.05	3.90	1.85
0.40	0.10	0.50	2.0	0.464	0.345	315.17	34.06	9.25	3.41	1.58
0.30	0.10	0.60	2.0	0.366	0.266	238.60	31.15	7.66	3.11	1.38
0.20	0.10	0.70	2.0	0.270	0.188	162.16	28.78	5.63	2.88	1.23
0.10	0.10	0.80	2.0	0.163	0.105	85.91	21.30	4.03	2.13	1.11
0.00	0.10	0.90	2.0	0.068	0.027	11.77	17.31	0.68	1.73	1.01
0.80	0.20	0.00	3.0	0.960	0.704	668.19	40.50	16.50	4.05	4.71
0.70	0.20	0.10	3.0	0.861	0.624	588.58	40.29	14.61	4.03	3.26
0.60	0.20	0.20	3.0	0.761	0.544	508.87	40.14	12.68	4.01	2.50
0.50	0.20	0.30	3.0	0.662	0.465	429.25	39.97	10.74	4.00	2.02
0.40	0.20	0.40	3.0	0.566	0.386	350.39	40.62	8.63	4.06	1.70
0.30	0.20	0.50	2.0	0.463	0.305	272.41	37.01	7.36	3.70	1.47
0.20	0.20	0.60	2.0	0.367	0.227	195.30	35.24	5.54	3.52	1.30
0.10	0.20	0.70	2.0	0.271	0.148	118.65	33.26	3.57	3.33	1.16
0.00	0.20	0.80	2.0	0.164	0.066	43.04	25.54	1.69	2.55	1.05
0.70	0.30	0.00	3.0	0.960	0.664	628.27	40.42	15.54	4.04	3.86
0.60	0.30	0.10	3.0	0.861	0.584	548.68	40.20	13.65	4.02	2.83
0.50	0.30	0.20	3.0	0.761	0.504	468.96	40.06	11.71	4.01	2.23

Table D.2b: (continued)

s_{01}	s_{02}	s_{03}	F	$\bar{s}_{3grw}$	$\bar{r}_{grw}$	$\bar{V}_{grw}$	$\overline{DevC}$	$\frac{\bar{V}_{grw}}{\overline{DevC}}$	$\frac{\overline{DevC}}{n}\%$	$\frac{\overline{V^*}}{V_0}$
0.40	0.30	0.30	3.0	0.666	0.426	390.38	40.72	9.59	4.07	1.85
0.30	0.30	0.40	3.0	0.568	0.347	312.01	39.79	7.84	3.98	1.58
0.20	0.30	0.50	3.0	0.464	0.265	234.16	35.18	6.66	3.52	1.38
0.10	0.30	0.60	3.0	0.367	0.187	156.67	33.89	4.62	3.39	1.22
0.00	0.30	0.70	3.0	0.272	0.109	79.23	33.04	2.40	3.30	1.10
0.60	0.40	0.00	3.0	0.960	0.624	588.36	40.33	14.59	4.03	3.26
0.50	0.40	0.10	3.0	0.864	0.545	508.72	41.52	12.25	4.15	2.50
0.40	0.40	0.20	3.0	0.767	0.467	430.37	40.82	10.54	4.08	2.02
0.30	0.40	0.30	3.0	0.669	0.387	352.04	39.90	8.82	3.99	1.70
0.20	0.40	0.40	3.0	0.564	0.306	274.28	35.30	7.77	3.53	1.47
0.10	0.40	0.50	3.0	0.468	0.227	196.78	34.05	5.78	3.40	1.30
0.00	0.40	0.60	3.0	0.372	0.149	119.37	33.24	3.59	3.32	1.16
0.50	0.50	0.00	3.0	0.964	0.586	548.70	41.61	13.19	4.16	2.83
0.40	0.50	0.10	3.0	0.866	0.506	470.32	40.73	11.55	4.07	2.24
0.30	0.50	0.20	3.0	0.761	0.424	391.98	36.40	10.77	3.64	1.85
0.20	0.50	0.30	3.0	0.665	0.346	314.40	35.43	8.87	3.54	1.58
0.10	0.50	0.40	3.0	0.568	0.267	236.93	34.17	6.93	3.42	1.38
0.00	0.50	0.50	3.0	0.473	0.189	159.56	33.32	4.79	3.33	1.23
0.40	0.60	0.00	3.0	0.966	0.546	510.31	40.83	12.50	4.08	2.50
0.30	0.60	0.10	3.0	0.861	0.464	432.04	36.51	11.83	3.65	2.03
0.20	0.60	0.20	3.0	0.765	0.386	354.49	35.59	9.96	3.56	1.71
0.10	0.60	0.30	3.0	0.669	0.307	277.06	34.31	8.08	3.43	1.48
0.00	0.60	0.40	3.0	0.574	0.229	199.76	33.45	5.97	3.34	1.30
0.30	0.70	0.00	3.0	0.962	0.505	472.15	36.66	12.88	3.67	2.24
0.20	0.70	0.10	3.0	0.866	0.426	394.57	35.77	11.03	3.58	1.86
0.10	0.70	0.20	3.0	0.770	0.348	317.17	34.49	9.20	3.45	1.59
0.00	0.70	0.30	3.0	0.666	0.266	240.13	28.73	8.36	2.87	1.39
0.20	0.80	0.00	3.0	0.966	0.466	434.68	35.59	12.21	3.56	2.03
0.10	0.80	0.10	3.0	0.871	0.388	357.30	34.76	10.28	3.48	1.71
0.00	0.80	0.20	3.0	0.767	0.306	280.53	28.49	9.85	2.85	1.48
0.10	0.90	0.00	3.0	0.972	0.428	397.50	34.89	11.39	3.49	1.86
0.00	0.90	0.10	3.0	0.868	0.346	320.86	28.76	11.16	2.88	1.59
0.00	1.00	0.00	3.0	0.970	0.387	361.23	28.98	12.46	2.90	1.72

Table D.2c: Simulation Results for the Set of Parameters: $n = 1{,}000$, $t = 5, d = 5$, $\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.10, 0.50, 0.90)$

s_{01}	s_{02}	s_{03}	SD(s_2^*)	SD(s_3^*)	SD($r(\underline{s}^*)$)	SD(V^*)	Min(B^*)	SD(B^*)	SD(D^*)	SD(T^*)
1.00	0.00	0.00	0.01	0.01	0.00	17.84	795.00	21.17	2.16	2.33
0.90	0.00	0.10	0.00	0.00	0.00	17.95	795.00	21.12	2.16	2.32
0.80	0.00	0.20	0.02	0.01	0.00	22.13	785.00	22.65	2.37	2.46
0.70	0.00	0.30	0.02	0.02	0.01	23.66	785.00	22.76	2.41	2.42
0.60	0.00	0.40	0.02	0.02	0.01	24.39	785.00	22.49	2.41	2.36
0.50	0.00	0.50	0.02	0.02	0.01	24.40	785.00	21.78	2.35	2.27
0.40	0.00	0.60	0.02	0.02	0.00	23.58	785.00	22.78	2.26	2.45
0.30	0.00	0.70	0.02	0.02	0.01	24.45	750.00	22.74	2.04	2.68
0.20	0.00	0.80	0.02	0.01	0.01	22.25	780.00	20.08	1.78	2.40
0.10	0.00	0.90	0.01	0.01	0.00	17.28	815.00	15.23	1.30	1.91
0.00	0.00	1.00	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.90	0.10	0.00	0.01	0.01	0.00	17.83	795.00	21.15	2.16	2.32
0.80	0.10	0.10	0.00	0.00	0.00	17.91	795.00	21.07	2.15	2.32
0.70	0.10	0.20	0.00	0.00	0.00	17.99	765.00	21.05	2.14	2.42
0.60	0.10	0.30	0.00	0.00	0.00	18.09	765.00	21.01	2.13	2.42
0.50	0.10	0.40	0.01	0.01	0.00	20.12	750.00	21.34	2.36	2.34
0.40	0.10	0.50	0.01	0.00	0.00	19.79	750.00	22.20	2.32	2.45
0.30	0.10	0.60	0.01	0.01	0.00	20.09	750.00	21.49	2.25	2.31
0.20	0.10	0.70	0.01	0.01	0.00	19.80	785.00	20.35	2.09	2.29
0.10	0.10	0.80	0.00	0.00	0.00	16.79	805.00	19.78	1.65	2.56
0.00	0.10	0.90	0.00	0.00	0.00	14.05	825.00	15.83	1.21	2.19
0.80	0.20	0.00	0.01	0.01	0.00	17.79	795.00	21.10	2.15	2.32
0.70	0.20	0.10	0.00	0.00	0.00	17.89	795.00	21.05	2.15	2.31
0.60	0.20	0.20	0.00	0.00	0.00	17.97	765.00	21.02	2.13	2.42
0.50	0.20	0.30	0.00	0.00	0.00	18.04	765.00	20.94	2.12	2.42
0.40	0.20	0.40	0.01	0.01	0.00	18.93	780.00	20.73	2.26	2.32
0.30	0.20	0.50	0.01	0.01	0.00	18.42	750.00	20.96	2.30	2.35
0.20	0.20	0.60	0.01	0.01	0.00	18.57	785.00	20.22	2.21	2.27
0.10	0.20	0.70	0.01	0.01	0.00	18.39	785.00	19.16	1.95	2.19
0.00	0.20	0.80	0.01	0.01	0.00	15.71	785.00	18.34	1.65	2.20
0.70	0.30	0.00	0.01	0.01	0.00	17.77	795.00	21.08	2.15	2.32
0.60	0.30	0.10	0.00	0.00	0.00	17.84	795.00	21.00	2.14	2.31
0.50	0.30	0.20	0.00	0.00	0.00	17.91	765.00	20.96	2.12	2.42

Table D.2c: (continued)

s_{01}	s_{02}	s_{03}	SD(s_2^*)	SD(s_3^*)	SD$(r(\underline{s}^*))$	SD(V^*)	Min(B^*)	SD(B^*)	SD(D^*)	SD(T^*)
0.40	0.30	0.30	0.01	0.01	0.00	19.03	780.00	20.74	2.26	2.32
0.30	0.30	0.40	0.01	0.01	0.00	19.37	780.00	20.30	2.19	2.30
0.20	0.30	0.50	0.00	0.00	0.00	18.68	780.00	21.21	2.13	2.48
0.10	0.30	0.60	0.01	0.01	0.00	19.28	780.00	20.60	2.08	2.35
0.00	0.30	0.70	0.01	0.01	0.00	19.75	780.00	20.06	1.99	2.42
0.60	0.40	0.00	0.01	0.01	0.00	17.73	795.00	21.03	2.14	2.32
0.50	0.40	0.10	0.01	0.01	0.00	18.67	780.00	21.08	2.30	2.36
0.40	0.40	0.20	0.01	0.01	0.00	19.16	780.00	20.79	2.27	2.32
0.30	0.40	0.30	0.01	0.01	0.00	19.52	780.00	20.36	2.23	2.26
0.20	0.40	0.40	0.00	0.00	0.00	18.93	780.00	21.25	2.14	2.47
0.10	0.40	0.50	0.01	0.01	0.00	19.55	780.00	20.69	2.10	2.35
0.00	0.40	0.60	0.01	0.01	0.00	20.08	780.00	20.22	2.01	2.44
0.50	0.50	0.00	0.01	0.01	0.00	18.77	780.00	21.08	2.30	2.35
0.40	0.50	0.10	0.01	0.01	0.00	19.24	780.00	20.76	2.28	2.27
0.30	0.50	0.20	0.01	0.01	0.00	18.48	780.00	21.79	2.23	2.37
0.20	0.50	0.30	0.00	0.00	0.00	19.17	780.00	21.29	2.15	2.47
0.10	0.50	0.40	0.01	0.01	0.00	19.78	780.00	20.72	2.10	2.37
0.00	0.50	0.50	0.01	0.01	0.00	20.36	780.00	20.25	2.03	2.41
0.40	0.60	0.00	0.01	0.01	0.00	19.35	780.00	20.77	2.28	2.27
0.30	0.60	0.10	0.00	0.00	0.00	18.59	780.00	21.75	2.24	2.47
0.20	0.60	0.20	0.00	0.00	0.00	19.43	780.00	21.36	2.16	2.47
0.10	0.60	0.30	0.01	0.01	0.00	20.06	780.00	20.80	2.11	2.38
0.00	0.60	0.40	0.01	0.01	0.00	20.62	780.00	20.30	2.04	2.41
0.30	0.70	0.00	0.00	0.00	0.00	18.82	780.00	21.81	2.24	2.47
0.20	0.70	0.10	0.01	0.01	0.00	19.70	780.00	21.44	2.18	2.48
0.10	0.70	0.20	0.01	0.01	0.00	20.36	780.00	20.91	2.13	2.39
0.00	0.70	0.30	0.01	0.00	0.00	19.37	780.00	21.66	2.03	2.58
0.20	0.80	0.00	0.01	0.01	0.00	19.84	780.00	21.33	2.18	2.40
0.10	0.80	0.10	0.01	0.01	0.00	20.59	780.00	20.94	2.12	2.46
0.00	0.80	0.20	0.01	0.00	0.00	19.60	780.00	21.50	2.04	2.49
0.10	0.90	0.00	0.01	0.01	0.00	20.87	780.00	21.01	2.13	2.47
0.00	0.90	0.10	0.01	0.01	0.00	20.04	780.00	21.62	2.06	2.51
0.00	1.00	0.00	0.01	0.01	0.00	20.46	780.00	21.70	2.07	2.51

Table D.3a: Simulation Results for the Set of Parameters: $n = 1{,}000$, $t = 5, d = 5$, $\underline{u}_a(g = 0.05, f = 0.25)$, and $\underline{r} = (0.10, 0.30, 0.50)$

s_{01}	s_{02}	s_{03}	$\overline{s_1^*}$	$\overline{s_2^*}$	$\overline{s_3^*}$	$r(\underline{s}_0)$	$\overline{r(\underline{s}^*)}$	V_0	$\overline{V^*}$	$\overline{B^*}$	$\overline{D^*}$	$\overline{T^*}$
1.00	0.00	0.00	0.030	0.209	0.761	0.100	0.446	100.00	366.73	818.20	11.70	24.66
0.90	0.00	0.10	0.029	0.200	0.771	0.140	0.448	140.00	369.09	819.37	11.01	25.11
0.80	0.00	0.20	0.029	0.179	0.792	0.180	0.452	180.00	376.52	827.37	9.83	24.69
0.70	0.00	0.30	0.029	0.154	0.817	0.220	0.458	220.00	387.65	841.59	8.44	23.24
0.60	0.00	0.40	0.028	0.130	0.841	0.260	0.463	260.00	399.56	857.51	7.09	21.41
0.50	0.00	0.50	0.029	0.107	0.865	0.300	0.467	300.00	412.03	875.67	5.80	19.06
0.40	0.00	0.60	0.026	0.086	0.888	0.340	0.472	340.00	425.15	894.09	4.65	16.53
0.30	0.00	0.70	0.026	0.062	0.912	0.380	0.477	380.00	439.00	915.01	3.41	13.59
0.20	0.00	0.80	0.022	0.041	0.937	0.420	0.483	420.00	453.98	936.25	2.17	10.58
0.10	0.00	0.90	0.026	0.017	0.957	0.460	0.486	460.00	471.33	967.78	0.97	5.48
0.00	0.00	1.00	0.000	0.000	1.000	0.500	0.500	500.00	500.00	1000.00	0.00	0.00
0.90	0.10	0.00	0.029	0.208	0.763	0.120	0.447	120.00	367.51	819.31	11.60	24.53
0.80	0.10	0.10	0.029	0.209	0.762	0.160	0.446	160.00	368.21	821.46	11.38	24.33
0.70	0.10	0.20	0.029	0.198	0.773	0.200	0.449	200.00	375.01	831.75	9.50	24.15
0.60	0.10	0.30	0.028	0.183	0.789	0.240	0.452	240.00	385.00	846.85	8.03	22.60
0.50	0.10	0.40	0.027	0.167	0.807	0.280	0.456	280.00	396.76	865.54	6.57	20.32
0.40	0.10	0.50	0.027	0.150	0.823	0.320	0.459	320.00	408.95	886.23	5.19	17.56
0.30	0.10	0.60	0.026	0.133	0.841	0.360	0.463	360.00	421.59	906.76	4.00	14.65
0.20	0.10	0.70	0.023	0.117	0.860	0.400	0.467	400.00	435.79	928.99	2.68	11.52
0.10	0.10	0.80	0.021	0.101	0.878	0.440	0.471	440.00	452.88	958.89	1.28	6.94
0.00	0.10	0.90	0.000	0.100	0.900	0.480	0.480	480.00	480.00	1000.00	0.00	0.00
0.80	0.20	0.00	0.029	0.206	0.764	0.140	0.447	140.00	368.07	819.95	11.52	24.49
0.70	0.20	0.10	0.030	0.208	0.763	0.180	0.447	180.00	368.89	822.54	11.32	24.18
0.60	0.20	0.20	0.028	0.212	0.760	0.220	0.447	220.00	373.72	833.85	9.28	23.95
0.50	0.20	0.30	0.026	0.206	0.768	0.260	0.448	260.00	383.27	851.48	7.67	22.03
0.40	0.20	0.40	0.026	0.199	0.775	0.300	0.450	300.00	393.67	872.37	6.11	19.42
0.30	0.20	0.50	0.023	0.188	0.789	0.340	0.453	340.00	406.03	892.56	4.85	16.63
0.20	0.20	0.60	0.020	0.176	0.803	0.380	0.457	380.00	419.57	916.10	3.41	13.37
0.10	0.20	0.70	0.021	0.174	0.804	0.420	0.457	420.00	434.91	950.98	1.73	8.08
0.00	0.20	0.80	0.000	0.200	0.800	0.460	0.460	460.00	460.00	1000.00	0.00	0.00
0.70	0.30	0.00	0.030	0.205	0.765	0.160	0.447	160.00	368.70	821.07	11.43	24.36
0.60	0.30	0.10	0.029	0.205	0.766	0.200	0.447	200.00	370.33	824.52	10.73	24.36
0.50	0.30	0.20	0.028	0.215	0.757	0.240	0.446	240.00	372.97	833.59	9.49	23.80

Table D.3a: (continued)

s_{01}	s_{02}	s_{03}	$\overline{s_1^*}$	$\overline{s_2^*}$	$\overline{s_3^*}$	$r(\underline{s}_0)$	$\overline{r(\underline{s}^*)}$	V_0	$\overline{V^*}$	$[B^*]$	$\overline{D^*}$	$\overline{T^*}$
0.40	0.30	0.30	0.026	0.227	0.748	0.280	0.444	280.00	381.22	855.74	7.53	21.32
0.30	0.30	0.40	0.025	0.225	0.750	0.320	0.445	320.00	391.94	878.63	5.90	18.38
0.20	0.30	0.50	0.022	0.227	0.751	0.360	0.446	360.00	403.90	904.17	4.23	14.94
0.10	0.30	0.60	0.022	0.236	0.742	0.400	0.444	400.00	417.62	939.55	2.43	9.66
0.00	0.30	0.70	0.000	0.300	0.700	0.440	0.440	440.00	440.00	1000.00	0.00	0.00
0.60	0.40	0.00	0.029	0.201	0.769	0.180	0.448	180.00	370.10	822.45	10.87	24.64
0.50	0.40	0.10	0.029	0.203	0.768	0.220	0.448	220.00	371.17	825.31	10.70	24.24
0.40	0.40	0.20	0.027	0.221	0.752	0.260	0.445	260.00	373.31	836.36	9.29	23.43
0.30	0.40	0.30	0.024	0.237	0.739	0.300	0.443	300.00	380.68	857.95	7.45	20.96
0.20	0.40	0.40	0.021	0.251	0.728	0.340	0.441	340.00	390.21	883.11	5.63	17.74
0.10	0.40	0.50	0.017	0.269	0.714	0.380	0.439	380.00	402.10	915.06	3.71	13.28
0.00	0.40	0.60	0.000	0.400	0.600	0.420	0.420	420.00	420.00	1000.00	0.00	0.00
0.50	0.50	0.00	0.029	0.199	0.772	0.200	0.449	200.00	371.21	823.88	10.78	24.45
0.40	0.50	0.10	0.029	0.201	0.770	0.240	0.448	240.00	372.17	826.52	10.59	24.11
0.30	0.50	0.20	0.027	0.219	0.754	0.280	0.445	280.00	373.24	835.32	9.42	23.52
0.20	0.50	0.30	0.023	0.249	0.728	0.320	0.441	320.00	379.84	860.16	7.29	20.67
0.10	0.50	0.40	0.019	0.284	0.697	0.360	0.436	360.00	388.86	892.98	5.14	16.27
0.00	0.50	0.50	0.007	0.356	0.637	0.400	0.426	400.00	402.26	945.94	2.39	8.42
0.40	0.60	0.00	0.029	0.196	0.775	0.220	0.449	220.00	372.44	825.05	10.64	24.35
0.30	0.60	0.10	0.029	0.198	0.774	0.260	0.449	260.00	373.42	827.79	10.44	24.00
0.20	0.60	0.20	0.029	0.200	0.771	0.300	0.448	300.00	374.54	831.93	10.18	23.44
0.10	0.60	0.30	0.022	0.266	0.712	0.340	0.438	340.00	379.48	866.55	7.04	19.65
0.00	0.60	0.40	0.013	0.351	0.636	0.380	0.425	380.00	387.87	915.79	4.15	12.70
0.30	0.70	0.00	0.029	0.193	0.778	0.240	0.450	240.00	373.50	826.45	10.55	24.17
0.20	0.70	0.10	0.029	0.195	0.776	0.280	0.450	280.00	374.41	828.89	10.37	23.86
0.10	0.70	0.20	0.029	0.198	0.773	0.320	0.449	320.00	375.89	833.60	10.03	23.25
0.00	0.70	0.30	0.023	0.252	0.725	0.360	0.440	360.00	378.85	859.53	7.84	20.26
0.20	0.80	0.00	0.029	0.191	0.781	0.260	0.450	260.00	374.57	827.59	10.47	24.01
0.10	0.80	0.10	0.028	0.193	0.779	0.300	0.450	300.00	375.57	830.13	10.27	23.70
0.00	0.80	0.20	0.028	0.195	0.777	0.340	0.450	340.00	377.06	834.83	9.94	23.09
0.10	0.90	0.00	0.029	0.188	0.784	0.280	0.451	280.00	375.56	828.43	10.39	23.92
0.00	0.90	0.10	0.029	0.190	0.781	0.320	0.450	320.00	376.80	832.62	10.14	23.34
0.00	1.00	0.00	0.029	0.182	0.789	0.300	0.452	300.00	376.38	827.64	10.09	24.39

Table D.3b: Simulation Results for the Set of Parameters: $n = 1{,}000$, $t = 5, d = 5$, $\underline{u}_a(g = 0.05, f = 0.25)$, and $\underline{r} = (0.10, 0.30, 0.50)$

s_{01}	s_{02}	s_{03}	F	$\bar{s}_{3grw}$	$\bar{r}_{grw}$	$\bar{V}_{grw}$	$\overline{DevC}$	$\frac{\bar{V}_{grw}}{\overline{DevC}}$	$\frac{\overline{DevC}}{n}\%$	$\frac{\bar{V}^*}{V_0}$
1.00	0.00	0.00	3.0	0.761	0.346	266.73	181.80	1.47	18.18	3.67
0.90	0.00	0.10	2.0	0.671	0.308	229.09	180.63	1.27	18.06	2.64
0.80	0.00	0.20	2.0	0.592	0.272	196.52	172.63	1.14	17.26	2.09
0.70	0.00	0.30	2.0	0.517	0.238	167.65	158.41	1.06	15.84	1.76
0.60	0.00	0.40	2.0	0.441	0.203	139.56	142.49	0.98	14.25	1.54
0.50	0.00	0.50	2.0	0.365	0.167	112.03	124.33	0.90	12.43	1.37
0.40	0.00	0.60	2.0	0.288	0.132	85.15	105.91	0.80	10.59	1.25
0.30	0.00	0.70	2.0	0.212	0.097	59.00	84.99	0.69	8.50	1.16
0.20	0.00	0.80	2.0	0.137	0.063	33.98	63.75	0.53	6.38	1.08
0.10	0.00	0.90	2.0	0.057	0.026	11.33	32.22	0.35	3.22	1.02
0.00	0.00	1.00	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.90	0.10	0.00	3.0	0.763	0.327	247.51	180.69	1.37	18.07	3.06
0.80	0.10	0.10	3.0	0.662	0.286	208.21	178.54	1.17	17.85	2.30
0.70	0.10	0.20	2.0	0.573	0.249	175.01	168.25	1.04	16.83	1.88
0.60	0.10	0.30	2.0	0.489	0.212	145.00	153.15	0.95	15.32	1.60
0.50	0.10	0.40	2.0	0.407	0.176	116.76	134.46	0.87	13.45	1.42
0.40	0.10	0.50	2.0	0.323	0.139	88.95	113.77	0.78	11.38	1.28
0.30	0.10	0.60	2.0	0.241	0.103	61.59	93.24	0.66	9.32	1.17
0.20	0.10	0.70	2.0	0.160	0.067	35.79	71.01	0.50	7.10	1.09
0.10	0.10	0.80	2.0	0.078	0.031	12.88	41.11	0.31	4.11	1.03
0.00	0.10	0.90	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.80	0.20	0.00	3.0	0.764	0.307	228.07	180.05	1.27	18.01	2.63
0.70	0.20	0.10	3.0	0.663	0.267	188.89	177.46	1.06	17.75	2.05
0.60	0.20	0.20	2.0	0.560	0.227	153.72	166.15	0.93	16.62	1.70
0.50	0.20	0.30	2.0	0.468	0.188	123.27	148.52	0.83	14.85	1.47
0.40	0.20	0.40	2.0	0.375	0.150	93.67	127.63	0.73	12.76	1.31
0.30	0.20	0.50	2.0	0.289	0.113	66.03	107.44	0.61	10.74	1.19
0.20	0.20	0.60	2.0	0.203	0.077	39.57	83.90	0.47	8.39	1.10
0.10	0.20	0.70	2.0	0.104	0.037	14.91	49.02	0.30	4.90	1.04
0.00	0.20	0.80	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.70	0.30	0.00	3.0	0.765	0.287	208.70	178.93	1.17	17.89	2.30
0.60	0.30	0.10	3.0	0.666	0.247	170.33	175.48	0.97	17.55	1.85
0.50	0.30	0.20	2.0	0.557	0.206	132.97	166.41	0.80	16.64	1.55

Table D.3b: (continued)

s_{01}	s_{02}	s_{03}	F	$\bar{s}_{3grw}$	$\bar{r}_{grw}$	$\bar{V}_{grw}$	$\overline{DevC}$	$\frac{\bar{V}_{grw}}{\overline{DevC}}$	$\frac{\overline{DevC}}{n}\%$	$\frac{\overline{V^*}}{V_0}$
0.40	0.30	0.30	2.0	0.448	0.164	101.22	144.26	0.70	14.43	1.36
0.30	0.30	0.40	2.0	0.350	0.125	71.94	121.37	0.59	12.14	1.22
0.20	0.30	0.50	2.0	0.251	0.086	43.90	95.83	0.46	9.58	1.12
0.10	0.30	0.60	2.0	0.142	0.044	17.62	60.45	0.29	6.05	1.04
0.00	0.30	0.70	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.60	0.40	0.00	3.0	0.769	0.268	190.10	177.55	1.07	17.76	2.06
0.50	0.40	0.10	3.0	0.668	0.228	151.17	174.69	0.87	17.47	1.69
0.40	0.40	0.20	2.0	0.552	0.185	113.31	163.64	0.69	16.36	1.44
0.30	0.40	0.30	2.0	0.439	0.143	80.68	142.05	0.57	14.21	1.27
0.20	0.40	0.40	2.0	0.328	0.101	50.21	116.89	0.43	11.69	1.15
0.10	0.40	0.50	2.0	0.214	0.059	22.10	84.94	0.26	8.49	1.06
0.00	0.40	0.60	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.50	0.50	0.00	3.0	0.772	0.249	171.21	176.12	0.97	17.61	1.86
0.40	0.50	0.10	3.0	0.670	0.208	132.17	173.48	0.76	17.35	1.55
0.30	0.50	0.20	2.0	0.554	0.165	93.24	164.68	0.57	16.47	1.33
0.20	0.50	0.30	2.0	0.428	0.121	59.84	139.84	0.43	13.98	1.19
0.10	0.50	0.40	2.0	0.297	0.076	28.86	107.02	0.27	10.70	1.08
0.00	0.50	0.50	2.0	0.137	0.026	2.26	54.06	0.04	5.41	1.01
0.40	0.60	0.00	3.0	0.775	0.229	152.44	174.95	0.87	17.49	1.69
0.30	0.60	0.10	3.0	0.674	0.189	113.42	172.21	0.66	17.22	1.44
0.20	0.60	0.20	3.0	0.571	0.148	74.54	168.07	0.44	16.81	1.25
0.10	0.60	0.30	2.0	0.412	0.098	39.48	133.45	0.30	13.35	1.12
0.00	0.60	0.40	2.0	0.236	0.045	7.87	84.21	0.09	8.42	1.02
0.30	0.70	0.00	3.0	0.778	0.210	133.50	173.55	0.77	17.36	1.56
0.20	0.70	0.10	3.0	0.676	0.170	94.41	171.11	0.55	17.11	1.34
0.10	0.70	0.20	3.0	0.573	0.129	55.89	166.40	0.34	16.64	1.17
0.00	0.70	0.30	2.0	0.425	0.080	18.85	140.47	0.13	14.05	1.05
0.20	0.80	0.00	3.0	0.781	0.190	114.57	172.41	0.66	17.24	1.44
0.10	0.80	0.10	3.0	0.679	0.150	75.57	169.87	0.44	16.99	1.25
0.00	0.80	0.20	3.0	0.577	0.110	37.06	165.17	0.22	16.52	1.11
0.10	0.90	0.00	3.0	0.784	0.171	95.56	171.57	0.56	17.16	1.34
0.00	0.90	0.10	3.0	0.681	0.130	56.80	167.38	0.34	16.74	1.18
0.00	1.00	0.00	3.0	0.789	0.152	76.38	172.36	0.44	17.24	1.25

Table D.3c: Simulation Results Runs for the Set of Parameters: $n = 1{,}000$, $t = 5, d = 5$
$\underline{u}_a(g = 0.05, f = 0.25)$, and $\underline{r} = (0.10, 0.30, 0.50)$

s_{01}	s_{02}	s_{03}	SD (s_2^*)	SD (s_3^*)	SD $(r(\underline{s}^*))$	SD (V^*)	Min (B^*)	SD (B^*)	SD (D^*)	SD (T^*)
1.00	0.00	0.00	0.07	0.08	0.02	69.35	80.00	140.49	10.46	18.32
0.90	0.00	0.10	0.08	0.09	0.02	70.23	80.00	138.01	10.30	18.01
0.80	0.00	0.20	0.10	0.11	0.02	75.23	80.00	141.06	10.45	18.45
0.70	0.00	0.30	0.11	0.12	0.03	78.11	80.00	140.21	10.18	18.50
0.60	0.00	0.40	0.12	0.12	0.03	79.20	80.00	137.56	9.82	18.29
0.50	0.00	0.50	0.12	0.12	0.03	78.58	80.00	134.67	9.24	18.26
0.40	0.00	0.60	0.11	0.12	0.03	76.24	85.00	128.15	8.61	17.54
0.30	0.00	0.70	0.10	0.11	0.02	70.74	80.00	118.04	7.69	16.39
0.20	0.00	0.80	0.09	0.10	0.02	61.72	80.00	101.25	6.25	14.43
0.10	0.00	0.90	0.06	0.07	0.01	44.46	120.00	75.00	4.46	10.88
0.00	0.00	1.00	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.90	0.10	0.00	0.07	0.08	0.02	69.52	80.00	140.29	10.45	18.30
0.80	0.10	0.10	0.07	0.08	0.02	69.18	80.00	140.32	10.45	18.31
0.70	0.10	0.20	0.07	0.08	0.02	70.97	80.00	140.29	10.39	18.35
0.60	0.10	0.30	0.08	0.09	0.02	72.77	80.00	139.44	10.07	18.45
0.50	0.10	0.40	0.08	0.09	0.02	72.90	85.00	135.91	9.62	18.14
0.40	0.10	0.50	0.08	0.09	0.02	71.00	80.00	130.67	8.91	17.74
0.30	0.10	0.60	0.08	0.09	0.02	67.98	85.00	123.61	8.16	17.04
0.20	0.10	0.70	0.08	0.08	0.02	61.34	95.00	108.54	6.97	15.17
0.10	0.10	0.80	0.06	0.07	0.01	47.27	165.00	82.59	4.97	11.92
0.00	0.10	0.90	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.80	0.20	0.00	0.07	0.08	0.02	69.72	80.00	140.16	10.45	18.27
0.70	0.20	0.10	0.07	0.08	0.02	69.37	80.00	140.41	10.45	18.32
0.60	0.20	0.20	0.07	0.08	0.02	68.73	80.00	140.03	10.35	18.33
0.50	0.20	0.30	0.07	0.08	0.02	68.77	80.00	138.02	9.93	18.28
0.40	0.20	0.40	0.07	0.07	0.02	67.63	80.00	135.47	9.40	18.26
0.30	0.20	0.50	0.07	0.08	0.02	65.87	80.00	127.64	8.73	17.34
0.20	0.20	0.60	0.07	0.07	0.02	60.95	95.00	115.75	7.55	16.05
0.10	0.20	0.70	0.06	0.06	0.01	48.19	170.00	92.82	5.63	13.31
0.00	0.20	0.80	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.70	0.30	0.00	0.07	0.08	0.02	69.74	80.00	140.14	10.44	18.27
0.60	0.30	0.10	0.07	0.08	0.02	68.95	80.00	138.57	10.24	18.15
0.50	0.30	0.20	0.07	0.08	0.02	68.27	85.00	140.66	10.33	18.45

Table D.3c: (continued)

s_{01}	s_{02}	s_{03}	SD(s_2^*)	SD(s_3^*)	SD($r(\underline{s}^*)$)	SD(V^*)	Min(B^*)	SD(B^*)	SD(D^*)	SD(T^*)
0.40	0.30	0.30	0.07	0.08	0.02	65.63	80.00	138.32	9.91	18.33
0.30	0.30	0.40	0.07	0.07	0.02	63.64	85.00	134.24	9.31	18.07
0.20	0.30	0.50	0.07	0.07	0.02	59.49	80.00	124.17	8.21	17.08
0.10	0.30	0.60	0.06	0.06	0.01	49.47	95.00	105.76	6.67	14.88
0.00	0.30	0.70	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.60	0.40	0.00	0.07	0.08	0.02	70.03	80.00	139.22	10.30	18.22
0.50	0.40	0.10	0.07	0.08	0.02	69.76	80.00	139.34	10.30	18.22
0.40	0.40	0.20	0.08	0.09	0.02	67.35	95.00	140.00	10.28	18.35
0.30	0.40	0.30	0.09	0.09	0.02	64.36	80.00	137.74	9.84	18.26
0.20	0.40	0.40	0.08	0.08	0.02	61.12	85.00	133.32	9.22	17.94
0.10	0.40	0.50	0.08	0.08	0.02	54.45	80.00	120.18	7.90	16.54
0.00	0.40	0.60	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.50	0.50	0.00	0.07	0.08	0.02	70.47	80.00	139.19	10.29	18.22
0.40	0.50	0.10	0.07	0.08	0.02	70.34	80.00	139.63	10.31	18.27
0.30	0.50	0.20	0.09	0.09	0.02	67.90	95.00	140.35	10.33	18.37
0.20	0.50	0.30	0.10	0.10	0.02	63.13	80.00	137.60	9.77	18.29
0.10	0.50	0.40	0.10	0.10	0.02	56.91	95.00	131.38	8.93	17.82
0.00	0.50	0.50	0.10	0.09	0.02	41.17	80.00	102.61	6.50	14.36
0.40	0.60	0.00	0.08	0.08	0.02	71.13	80.00	139.42	10.31	18.25
0.30	0.60	0.10	0.07	0.08	0.02	70.80	80.00	139.61	10.31	18.28
0.20	0.60	0.20	0.07	0.08	0.02	70.01	80.00	139.84	10.26	18.36
0.10	0.60	0.30	0.12	0.11	0.02	61.16	80.00	138.06	9.68	18.47
0.00	0.60	0.40	0.14	0.13	0.02	48.95	95.00	124.61	8.23	17.12
0.30	0.70	0.00	0.08	0.09	0.02	71.57	80.00	139.57	10.30	18.29
0.20	0.70	0.10	0.08	0.08	0.02	71.41	80.00	139.83	10.31	18.31
0.10	0.70	0.20	0.07	0.08	0.02	70.20	80.00	139.03	10.20	18.26
0.00	0.70	0.30	0.12	0.12	0.02	63.97	80.00	139.98	10.01	18.55
0.20	0.80	0.00	0.08	0.09	0.02	72.11	80.00	139.59	10.30	18.29
0.10	0.80	0.10	0.08	0.09	0.02	71.83	80.00	139.56	10.30	18.27
0.00	0.80	0.20	0.07	0.08	0.02	70.63	80.00	138.77	10.19	18.22
0.10	0.90	0.00	0.08	0.09	0.02	72.67	80.00	139.52	10.29	18.29
0.00	0.90	0.10	0.08	0.09	0.02	71.74	80.00	139.52	10.26	18.30
0.00	1.00	0.00	0.09	0.10	0.02	74.22	80.00	140.27	10.35	18.36

Table D.4a: Simulation Results for the Set of Parameters: $n = 1{,}000$, $t = 5, d = 5$, $\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.10, 0.30, 0.50)$

s_{01}	s_{02}	s_{03}	$\overline{s_1^*}$	$\overline{s_2^*}$	$\overline{s_3^*}$	$r(\underline{s}_0)$	$\overline{r(\underline{s}^*)}$	V_0	$\overline{V^*}$	$\overline{B^*}$	$\overline{D^*}$	$\overline{T^*}$
1.00	0.00	0.00	0.009	0.087	0.904	0.100	0.479	100.00	451.65	942.84	4.43	7.01
0.90	0.00	0.10	0.009	0.086	0.905	0.140	0.479	140.00	451.92	943.05	4.40	6.99
0.80	0.00	0.20	0.009	0.085	0.906	0.180	0.479	180.00	452.23	943.28	4.38	6.97
0.70	0.00	0.30	0.009	0.085	0.907	0.220	0.480	220.00	452.51	943.40	4.37	6.95
0.60	0.00	0.40	0.010	0.069	0.921	0.260	0.482	260.00	454.38	942.11	3.56	8.02
0.50	0.00	0.50	0.011	0.054	0.935	0.300	0.485	300.00	457.41	943.37	2.78	8.54
0.40	0.00	0.60	0.013	0.042	0.945	0.340	0.486	340.00	460.94	947.46	2.17	8.34
0.30	0.00	0.70	0.012	0.034	0.955	0.380	0.489	380.00	465.62	952.75	1.74	7.71
0.20	0.00	0.80	0.012	0.022	0.966	0.420	0.491	420.00	471.35	960.14	1.10	6.87
0.10	0.00	0.90	0.017	0.009	0.974	0.460	0.491	460.00	479.24	975.33	0.47	4.47
0.00	0.00	1.00	0.000	0.000	1.000	0.500	0.500	500.00	500.00	1000.00	0.00	0.00
0.90	0.10	0.00	0.009	0.087	0.904	0.120	0.479	120.00	451.76	942.93	4.42	7.00
0.80	0.10	0.10	0.009	0.086	0.905	0.160	0.479	160.00	452.04	943.17	4.39	6.98
0.70	0.10	0.20	0.009	0.085	0.906	0.200	0.479	200.00	452.34	943.35	4.37	6.96
0.60	0.10	0.30	0.009	0.084	0.907	0.240	0.480	240.00	452.61	943.47	4.36	6.95
0.50	0.10	0.40	0.008	0.083	0.908	0.280	0.480	280.00	452.89	943.60	4.35	6.93
0.40	0.10	0.50	0.008	0.078	0.914	0.320	0.481	320.00	454.29	944.21	3.36	7.80
0.30	0.10	0.60	0.010	0.074	0.916	0.360	0.481	360.00	456.76	949.33	2.50	7.64
0.20	0.10	0.70	0.011	0.072	0.917	0.400	0.481	400.00	460.54	956.92	2.02	6.60
0.10	0.10	0.80	0.009	0.070	0.921	0.440	0.482	440.00	465.80	965.34	1.02	5.91
0.00	0.10	0.90	0.000	0.100	0.900	0.480	0.480	480.00	480.00	1000.00	0.00	0.00
0.80	0.20	0.00	0.009	0.086	0.905	0.140	0.479	140.00	451.89	943.08	4.41	6.98
0.70	0.20	0.10	0.009	0.086	0.905	0.180	0.479	180.00	452.16	943.25	4.38	6.97
0.60	0.20	0.20	0.009	0.085	0.906	0.220	0.480	220.00	452.44	943.42	4.36	6.95
0.50	0.20	0.30	0.008	0.084	0.907	0.260	0.480	260.00	452.73	943.56	4.35	6.94
0.40	0.20	0.40	0.008	0.083	0.908	0.300	0.480	300.00	453.01	943.71	4.34	6.92
0.30	0.20	0.50	0.009	0.088	0.904	0.340	0.479	340.00	454.01	947.94	3.41	7.00
0.20	0.20	0.60	0.008	0.083	0.909	0.380	0.480	380.00	455.48	948.59	3.35	6.93
0.10	0.20	0.70	0.007	0.084	0.909	0.420	0.480	420.00	458.80	955.09	2.07	6.91
0.00	0.20	0.80	0.003	0.107	0.890	0.460	0.477	460.00	464.49	973.27	0.95	4.39
0.70	0.30	0.00	0.009	0.086	0.905	0.160	0.479	160.00	452.00	943.15	4.40	6.97
0.60	0.30	0.10	0.009	0.086	0.906	0.200	0.479	200.00	452.26	943.34	4.37	6.96
0.50	0.30	0.20	0.009	0.085	0.907	0.240	0.480	240.00	452.56	943.51	4.36	6.94

Table D.4a: (continued)

s_{01}	s_{02}	s_{03}	$\overline{s_1^*}$	$\overline{s_2^*}$	$\overline{s_3^*}$	$r(\underline{s}_0)$	$\overline{r(\underline{s}^*)}$	V_0	$\overline{V^*}$	$\lfloor B^* \rfloor$	$\overline{D^*}$	$\overline{T^*}$
0.40	0.30	0.30	0.008	0.084	0.908	0.280	0.480	280.00	452.85	943.66	4.34	6.92
0.30	0.30	0.40	0.009	0.087	0.904	0.320	0.479	320.00	453.89	947.77	3.43	7.02
0.20	0.30	0.50	0.009	0.083	0.909	0.360	0.480	360.00	455.36	948.47	3.36	6.95
0.10	0.30	0.60	0.010	0.081	0.909	0.400	0.480	400.00	457.63	953.69	2.67	6.59
0.00	0.30	0.70	0.009	0.068	0.923	0.440	0.483	440.00	460.49	953.80	2.55	6.69
0.60	0.40	0.00	0.009	0.086	0.905	0.180	0.479	180.00	452.08	943.25	4.38	6.97
0.50	0.40	0.10	0.009	0.085	0.906	0.220	0.479	220.00	452.38	943.42	4.36	6.95
0.40	0.40	0.20	0.008	0.085	0.907	0.260	0.480	260.00	452.68	943.61	4.35	6.93
0.30	0.40	0.30	0.009	0.087	0.904	0.300	0.479	300.00	453.78	947.64	3.44	7.03
0.20	0.40	0.40	0.008	0.079	0.913	0.340	0.481	340.00	455.30	946.69	3.30	7.36
0.10	0.40	0.50	0.010	0.076	0.913	0.380	0.481	380.00	457.62	952.11	3.02	6.56
0.00	0.40	0.60	0.009	0.066	0.924	0.420	0.483	420.00	460.47	953.20	2.57	6.79
0.50	0.50	0.00	0.009	0.086	0.906	0.200	0.479	200.00	452.22	943.30	4.39	6.95
0.40	0.50	0.10	0.008	0.085	0.906	0.240	0.480	240.00	452.50	943.52	4.35	6.94
0.30	0.50	0.20	0.010	0.087	0.904	0.280	0.479	280.00	453.68	947.48	3.48	7.02
0.20	0.50	0.30	0.008	0.078	0.913	0.320	0.481	320.00	455.33	946.53	3.32	7.37
0.10	0.50	0.40	0.011	0.075	0.915	0.360	0.481	360.00	457.62	951.68	3.05	6.62
0.00	0.50	0.50	0.010	0.064	0.926	0.400	0.483	400.00	460.52	953.00	2.56	6.84
0.40	0.60	0.00	0.009	0.086	0.906	0.220	0.479	220.00	452.33	943.39	4.38	6.94
0.30	0.60	0.10	0.010	0.087	0.904	0.260	0.479	260.00	453.55	947.30	3.49	7.05
0.20	0.60	0.20	0.009	0.077	0.914	0.300	0.481	300.00	455.32	946.33	3.34	7.39
0.10	0.60	0.30	0.009	0.071	0.920	0.340	0.482	340.00	457.65	948.67	3.11	7.16
0.00	0.60	0.40	0.010	0.062	0.927	0.380	0.483	380.00	460.57	952.68	2.58	6.88
0.30	0.70	0.00	0.010	0.086	0.904	0.240	0.479	240.00	453.46	947.19	3.50	7.06
0.20	0.70	0.10	0.009	0.076	0.915	0.280	0.481	280.00	455.32	945.99	3.38	7.42
0.10	0.70	0.20	0.009	0.070	0.921	0.320	0.482	320.00	457.68	948.43	3.13	7.18
0.00	0.70	0.30	0.011	0.060	0.929	0.360	0.484	360.00	460.65	952.40	2.61	6.91
0.20	0.80	0.00	0.009	0.075	0.915	0.260	0.481	260.00	455.38	946.12	3.26	7.51
0.10	0.80	0.10	0.009	0.068	0.923	0.300	0.483	300.00	457.70	947.86	3.15	7.28
0.00	0.80	0.20	0.012	0.058	0.930	0.340	0.484	340.00	460.71	952.09	2.64	6.94
0.10	0.90	0.00	0.010	0.066	0.924	0.280	0.483	280.00	457.73	947.61	3.18	7.30
0.00	0.90	0.10	0.012	0.056	0.932	0.320	0.484	320.00	460.78	951.72	2.66	6.99
0.00	1.00	0.00	0.013	0.054	0.934	0.300	0.484	300.00	460.84	951.36	2.69	7.04

Table D.4b: Simulation Results for the Set of Parameters: $n = 1{,}000$, $t = 5, d = 5$, $\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.10, 0.30, 0.50)$

s_{01}	s_{02}	s_{03}	F	$\bar{s}_{3grw}$	$\bar{r}_{grw}$	$\bar{V}_{grw}$	$\overline{DevC}$	$\frac{\bar{V}_{grw}}{\overline{DevC}}$	$\frac{\overline{DevC}}{n}\%$	$\frac{\bar{V}^*}{V_0}$
1.00	0.00	0.00	3.0	0.904	0.379	351.65	57.16	6.15	5.72	4.52
0.90	0.00	0.10	3.0	0.805	0.339	311.92	56.95	5.48	5.70	3.23
0.80	0.00	0.20	3.0	0.706	0.299	272.23	56.72	4.80	5.67	2.51
0.70	0.00	0.30	3.0	0.607	0.260	232.51	56.60	4.11	5.66	2.06
0.60	0.00	0.40	2.0	0.521	0.222	194.38	57.89	3.36	5.79	1.75
0.50	0.00	0.50	2.0	0.435	0.185	157.41	56.63	2.78	5.66	1.52
0.40	0.00	0.60	2.0	0.345	0.146	120.94	52.54	2.30	5.25	1.36
0.30	0.00	0.70	2.0	0.255	0.109	85.62	47.25	1.81	4.73	1.23
0.20	0.00	0.80	2.0	0.166	0.071	51.35	39.86	1.29	3.99	1.12
0.10	0.00	0.90	2.0	0.074	0.031	19.24	24.67	0.78	2.47	1.04
0.00	0.00	1.00	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.90	0.10	0.00	3.0	0.904	0.359	331.76	57.07	5.81	5.71	3.76
0.80	0.10	0.10	3.0	0.805	0.319	292.04	56.83	5.14	5.68	2.83
0.70	0.10	0.20	3.0	0.706	0.279	252.34	56.65	4.45	5.66	2.26
0.60	0.10	0.30	3.0	0.607	0.240	212.61	56.53	3.76	5.65	1.89
0.50	0.10	0.40	3.0	0.508	0.200	172.89	56.40	3.07	5.64	1.62
0.40	0.10	0.50	2.0	0.414	0.161	134.29	55.79	2.41	5.58	1.42
0.30	0.10	0.60	2.0	0.316	0.121	96.76	50.67	1.91	5.07	1.27
0.20	0.10	0.70	2.0	0.217	0.081	60.54	43.08	1.41	4.31	1.15
0.10	0.10	0.80	2.0	0.121	0.042	25.80	34.66	0.74	3.47	1.06
0.00	0.10	0.90	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.80	0.20	0.00	3.0	0.905	0.339	311.89	56.92	5.48	5.69	3.23
0.70	0.20	0.10	3.0	0.805	0.299	272.16	56.75	4.80	5.67	2.51
0.60	0.20	0.20	3.0	0.706	0.260	232.44	56.58	4.11	5.66	2.06
0.50	0.20	0.30	3.0	0.607	0.220	192.73	56.44	3.41	5.64	1.74
0.40	0.20	0.40	3.0	0.508	0.180	153.01	56.29	2.72	5.63	1.51
0.30	0.20	0.50	3.0	0.404	0.139	114.01	52.06	2.19	5.21	1.34
0.20	0.20	0.60	3.0	0.309	0.100	75.48	51.41	1.47	5.14	1.20
0.10	0.20	0.70	2.0	0.209	0.060	38.80	44.91	0.86	4.49	1.09
0.00	0.20	0.80	2.0	0.090	0.017	4.49	26.73	0.17	2.67	1.01
0.70	0.30	0.00	3.0	0.905	0.319	292.00	56.85	5.14	5.68	2.82
0.60	0.30	0.10	3.0	0.806	0.279	252.26	56.66	4.45	5.67	2.26
0.50	0.30	0.20	3.0	0.707	0.240	212.56	56.49	3.76	5.65	1.89

Table D.4b: (continued)

s_{01}	s_{02}	s_{03}	F	$\bar{s}_{3grw}$	$\bar{r}_{grw}$	$\bar{V}_{grw}$	$\overline{DevC}$	$\frac{\bar{V}_{grw}}{\overline{DevC}}$	$\frac{\overline{DevC}}{n}$ %	$\frac{\overline{V^*}}{V_0}$
0.40	0.30	0.30	3.0	0.608	0.200	172.85	56.34	3.07	5.63	1.62
0.30	0.30	0.40	3.0	0.504	0.159	133.89	52.23	2.56	5.22	1.42
0.20	0.30	0.50	3.0	0.409	0.120	95.36	51.53	1.85	5.15	1.26
0.10	0.30	0.60	3.0	0.309	0.080	57.63	46.31	1.24	4.63	1.14
0.00	0.30	0.70	3.0	0.223	0.043	20.49	46.20	0.44	4.62	1.05
0.60	0.40	0.00	3.0	0.905	0.299	272.08	56.75	4.79	5.68	2.51
0.50	0.40	0.10	3.0	0.806	0.259	232.38	56.58	4.11	5.66	2.06
0.40	0.40	0.20	3.0	0.707	0.220	192.68	56.39	3.42	5.64	1.74
0.30	0.40	0.30	3.0	0.604	0.179	153.78	52.36	2.94	5.24	1.51
0.20	0.40	0.40	3.0	0.513	0.141	115.30	53.31	2.16	5.33	1.34
0.10	0.40	0.50	3.0	0.413	0.101	77.62	47.89	1.62	4.79	1.20
0.00	0.40	0.60	3.0	0.324	0.063	40.47	46.80	0.86	4.68	1.10
0.50	0.50	0.00	3.0	0.906	0.279	252.22	56.70	4.45	5.67	2.26
0.40	0.50	0.10	3.0	0.806	0.240	212.50	56.48	3.76	5.65	1.89
0.30	0.50	0.20	3.0	0.704	0.199	173.68	52.52	3.31	5.25	1.62
0.20	0.50	0.30	3.0	0.613	0.161	135.33	53.47	2.53	5.35	1.42
0.10	0.50	0.40	3.0	0.515	0.121	97.62	48.32	2.02	4.83	1.27
0.00	0.50	0.50	3.0	0.426	0.083	60.52	47.00	1.29	4.70	1.15
0.40	0.60	0.00	3.0	0.906	0.259	232.33	56.61	4.10	5.66	2.06
0.30	0.60	0.10	3.0	0.804	0.219	193.55	52.70	3.67	5.27	1.74
0.20	0.60	0.20	3.0	0.714	0.181	155.32	53.67	2.89	5.37	1.52
0.10	0.60	0.30	3.0	0.620	0.142	117.65	51.33	2.29	5.13	1.35
0.00	0.60	0.40	3.0	0.527	0.103	80.57	47.32	1.70	4.73	1.21
0.30	0.70	0.00	3.0	0.904	0.239	213.46	52.81	4.04	5.28	1.89
0.20	0.70	0.10	3.0	0.815	0.201	175.32	54.01	3.25	5.40	1.63
0.10	0.70	0.20	3.0	0.721	0.162	137.68	51.57	2.67	5.16	1.43
0.00	0.70	0.30	3.0	0.629	0.124	100.65	47.60	2.11	4.76	1.28
0.20	0.80	0.00	3.0	0.915	0.221	195.38	53.88	3.63	5.39	1.75
0.10	0.80	0.10	3.0	0.823	0.183	157.70	52.14	3.02	5.21	1.53
0.00	0.80	0.20	3.0	0.730	0.144	120.71	47.91	2.52	4.79	1.36
0.10	0.90	0.00	3.0	0.924	0.203	177.73	52.39	3.39	5.24	1.63
0.00	0.90	0.10	3.0	0.832	0.164	140.78	48.28	2.92	4.83	1.44
0.00	1.00	0.00	3.0	0.934	0.184	160.84	48.64	3.31	4.86	1.54

Table D.4c: Simulation Results for the Set of Parameters: $n = 1{,}000$, $t = 5, d = 5$, $\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.10, 0.30, 0.50)$

s_{01}	s_{02}	s_{03}	SD(s_2^*)	SD(s_3^*)	SD($r(\underline{s}^*)$)	SD(V^*)	Min(B^*)	SD(B^*)	SD(D^*)	SD(T^*)
1.00	0.00	0.00	0.01	0.01	0.00	18.48	595.00	38.47	2.81	5.21
0.90	0.00	0.10	0.01	0.01	0.00	18.58	595.00	38.40	2.81	5.21
0.80	0.00	0.20	0.01	0.01	0.00	18.72	595.00	38.35	2.80	5.21
0.70	0.00	0.30	0.01	0.01	0.00	18.86	595.00	38.34	2.80	5.21
0.60	0.00	0.40	0.03	0.03	0.01	21.65	595.00	39.05	3.08	5.32
0.50	0.00	0.50	0.04	0.04	0.01	23.32	545.00	39.16	3.06	5.38
0.40	0.00	0.60	0.04	0.04	0.01	24.01	560.00	39.94	2.93	5.60
0.30	0.00	0.70	0.04	0.04	0.01	23.98	560.00	38.37	2.77	5.45
0.20	0.00	0.80	0.04	0.04	0.01	22.94	695.00	36.49	2.32	5.43
0.10	0.00	0.90	0.03	0.02	0.00	18.62	705.00	32.04	1.60	5.15
0.00	0.00	1.00	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.90	0.10	0.00	0.01	0.01	0.00	18.51	595.00	38.45	2.81	5.21
0.80	0.10	0.10	0.01	0.01	0.00	18.63	595.00	38.39	2.81	5.21
0.70	0.10	0.20	0.01	0.01	0.00	18.76	595.00	38.34	2.80	5.21
0.60	0.10	0.30	0.01	0.01	0.00	18.91	595.00	38.34	2.80	5.21
0.50	0.10	0.40	0.01	0.01	0.00	19.04	595.00	38.32	2.80	5.21
0.40	0.10	0.50	0.02	0.02	0.00	20.22	595.00	38.42	3.06	5.15
0.30	0.10	0.60	0.02	0.02	0.00	20.52	565.00	39.70	3.01	5.36
0.20	0.10	0.70	0.02	0.02	0.00	19.80	595.00	38.12	2.83	5.16
0.10	0.10	0.80	0.02	0.02	0.00	19.02	600.00	34.15	2.17	4.91
0.00	0.10	0.90	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.80	0.20	0.00	0.01	0.01	0.00	18.52	595.00	38.35	2.81	5.19
0.70	0.20	0.10	0.01	0.01	0.00	18.66	595.00	38.36	2.81	5.21
0.60	0.20	0.20	0.01	0.01	0.00	18.80	595.00	38.35	2.80	5.21
0.50	0.20	0.30	0.01	0.01	0.00	18.93	595.00	38.31	2.80	5.21
0.40	0.20	0.40	0.01	0.01	0.00	19.04	595.00	38.23	2.80	5.19
0.30	0.20	0.50	0.01	0.01	0.00	18.40	595.00	38.60	2.83	5.23
0.20	0.20	0.60	0.01	0.01	0.00	19.18	595.00	38.41	2.82	5.21
0.10	0.20	0.70	0.02	0.02	0.00	18.92	565.00	37.64	2.72	5.17
0.00	0.20	0.80	0.03	0.03	0.00	15.00	650.00	33.94	2.04	4.93
0.70	0.30	0.00	0.01	0.01	0.00	18.56	595.00	38.35	2.81	5.19
0.60	0.30	0.10	0.01	0.01	0.00	18.70	595.00	38.37	2.81	5.22
0.50	0.30	0.20	0.01	0.01	0.00	18.83	595.00	38.32	2.80	5.21

Table D.4c: (continued)

s_{01}	s_{02}	s_{03}	SD(s_2^*)	SD(s_3^*)	SD($r(\underline{s}^*)$)	SD(V^*)	Min(B^*)	SD(B^*)	SD(D^*)	SD(T^*)
0.40	0.30	0.30	0.01	0.01	0.00	18.93	595.00	38.22	2.80	5.19
0.30	0.30	0.40	0.01	0.01	0.00	18.41	595.00	38.66	2.83	5.24
0.20	0.30	0.50	0.01	0.01	0.00	19.20	595.00	38.41	2.82	5.21
0.10	0.30	0.60	0.02	0.02	0.00	18.84	640.00	37.21	2.58	5.15
0.00	0.30	0.70	0.02	0.02	0.00	20.22	640.00	37.14	2.60	5.16
0.60	0.40	0.00	0.01	0.01	0.00	18.62	595.00	38.42	2.81	5.22
0.50	0.40	0.10	0.01	0.01	0.00	18.73	595.00	38.34	2.80	5.21
0.40	0.40	0.20	0.01	0.01	0.00	18.82	595.00	38.23	2.80	5.19
0.30	0.40	0.30	0.01	0.01	0.00	18.41	595.00	38.64	2.83	5.23
0.20	0.40	0.40	0.01	0.01	0.00	19.71	640.00	38.32	2.90	5.17
0.10	0.40	0.50	0.01	0.02	0.00	19.37	640.00	37.92	2.84	5.11
0.00	0.40	0.60	0.02	0.02	0.00	20.59	560.00	37.61	2.64	5.24
0.50	0.50	0.00	0.01	0.01	0.00	18.64	595.00	38.35	2.81	5.19
0.40	0.50	0.10	0.01	0.01	0.00	18.73	595.00	38.25	2.80	5.20
0.30	0.50	0.20	0.01	0.01	0.00	18.44	595.00	38.61	2.83	5.22
0.20	0.50	0.30	0.01	0.01	0.00	19.80	640.00	38.33	2.91	5.17
0.10	0.50	0.40	0.02	0.02	0.00	19.58	640.00	38.21	2.85	5.15
0.00	0.50	0.50	0.02	0.02	0.00	20.76	560.00	37.68	2.64	5.28
0.40	0.60	0.00	0.01	0.01	0.00	18.67	595.00	38.31	2.80	5.19
0.30	0.60	0.10	0.01	0.01	0.00	18.54	595.00	38.79	2.85	5.24
0.20	0.60	0.20	0.01	0.02	0.00	19.94	640.00	38.39	2.92	5.18
0.10	0.60	0.30	0.02	0.02	0.00	20.58	640.00	37.80	2.87	5.12
0.00	0.60	0.40	0.02	0.02	0.00	20.99	560.00	37.91	2.67	5.31
0.30	0.70	0.00	0.01	0.01	0.00	18.50	595.00	38.68	2.85	5.22
0.20	0.70	0.10	0.02	0.02	0.00	20.11	640.00	38.59	2.93	5.19
0.10	0.70	0.20	0.02	0.02	0.00	20.74	640.00	37.88	2.88	5.12
0.00	0.70	0.30	0.02	0.02	0.00	21.14	560.00	37.99	2.68	5.31
0.20	0.80	0.00	0.02	0.02	0.00	20.21	610.00	38.46	2.92	5.25
0.10	0.80	0.10	0.02	0.02	0.00	20.97	640.00	38.14	2.90	5.19
0.00	0.80	0.20	0.02	0.02	0.00	21.33	560.00	38.11	2.69	5.32
0.10	0.90	0.00	0.02	0.02	0.00	21.18	610.00	38.29	2.92	5.19
0.00	0.90	0.10	0.03	0.02	0.00	21.54	560.00	38.33	2.71	5.36
0.00	1.00	0.00	0.03	0.03	0.00	21.76	560.00	38.52	2.73	5.38

Table D.5a: Simulation Results for the Set of Parameters: $n = 1{,}000$, $t = 5, d = 5$, $\underline{u}_a(g = 0.05, f = 0.25)$, and $\underline{r} = (0.80, 0.85, 0.90)$

s_{01}	s_{02}	s_{03}	$\overline{s_1^*}$	$\overline{s_2^*}$	$\overline{s_3^*}$	$r(\underline{s}_0)$	$\overline{r(\underline{s}^*)}$	V_0	$\overline{V^*}$	$\lfloor B^* \rfloor$	$\overline{D^*}$	$\overline{T^*}$
1.00	0.00	0.00	0.708	0.139	0.153	0.800	0.822	800.00	814.00	990.00	2.00	0.00
0.90	0.00	0.10	0.722	0.143	0.136	0.810	0.821	810.00	816.58	995.00	1.00	0.00
0.80	0.00	0.20	0.800	0.000	0.200	0.820	0.820	820.00	820.00	1000.00	0.00	0.00
0.70	0.00	0.30	0.700	0.000	0.300	0.830	0.830	830.00	830.00	1000.00	0.00	0.00
0.60	0.00	0.40	0.600	0.000	0.400	0.840	0.840	840.00	840.00	1000.00	0.00	0.00
0.50	0.00	0.50	0.500	0.000	0.500	0.850	0.850	850.00	850.00	1000.00	0.00	0.00
0.40	0.00	0.60	0.400	0.000	0.600	0.860	0.860	860.00	860.00	1000.00	0.00	0.00
0.30	0.00	0.70	0.300	0.000	0.700	0.870	0.870	870.00	870.00	1000.00	0.00	0.00
0.20	0.00	0.80	0.200	0.000	0.800	0.880	0.880	880.00	880.00	1000.00	0.00	0.00
0.10	0.00	0.90	0.100	0.000	0.900	0.890	0.890	890.00	890.00	1000.00	0.00	0.00
0.00	0.00	1.00	0.000	0.000	1.000	0.900	0.900	900.00	900.00	1000.00	0.00	0.00
0.90	0.10	0.00	0.758	0.112	0.131	0.805	0.819	805.00	814.56	995.00	1.00	0.00
0.80	0.10	0.10	0.717	0.136	0.147	0.815	0.822	815.00	817.42	995.00	1.00	0.00
0.70	0.10	0.20	0.700	0.100	0.200	0.825	0.825	825.00	825.00	1000.00	0.00	0.00
0.60	0.10	0.30	0.600	0.100	0.300	0.835	0.835	835.00	835.00	1000.00	0.00	0.00
0.50	0.10	0.40	0.500	0.100	0.400	0.845	0.845	845.00	845.00	1000.00	0.00	0.00
0.40	0.10	0.50	0.400	0.100	0.500	0.855	0.855	855.00	855.00	1000.00	0.00	0.00
0.30	0.10	0.60	0.300	0.100	0.600	0.865	0.865	865.00	865.00	1000.00	0.00	0.00
0.20	0.10	0.70	0.200	0.100	0.700	0.875	0.875	875.00	875.00	1000.00	0.00	0.00
0.10	0.10	0.80	0.100	0.100	0.800	0.885	0.885	885.00	885.00	1000.00	0.00	0.00
0.00	0.10	0.90	0.000	0.100	0.900	0.895	0.895	895.00	895.00	1000.00	0.00	0.00
0.80	0.20	0.00	0.753	0.105	0.142	0.810	0.819	810.00	815.40	995.00	1.00	0.00
0.70	0.20	0.10	0.700	0.200	0.100	0.820	0.820	820.00	820.00	1000.00	0.00	0.00
0.60	0.20	0.20	0.600	0.200	0.200	0.830	0.830	830.00	830.00	1000.00	0.00	0.00
0.50	0.20	0.30	0.500	0.200	0.300	0.840	0.840	840.00	840.00	1000.00	0.00	0.00
0.40	0.20	0.40	0.400	0.200	0.400	0.850	0.850	850.00	850.00	1000.00	0.00	0.00
0.30	0.20	0.50	0.300	0.200	0.500	0.860	0.860	860.00	860.00	1000.00	0.00	0.00
0.20	0.20	0.60	0.200	0.200	0.600	0.870	0.870	870.00	870.00	1000.00	0.00	0.00
0.10	0.20	0.70	0.100	0.200	0.700	0.880	0.880	880.00	880.00	1000.00	0.00	0.00
0.00	0.20	0.80	0.000	0.200	0.800	0.890	0.890	890.00	890.00	1000.00	0.00	0.00
0.70	0.30	0.00	0.747	0.098	0.154	0.815	0.820	815.00	816.24	995.00	1.00	0.00
0.60	0.30	0.10	0.600	0.300	0.100	0.825	0.825	825.00	825.00	1000.00	0.00	0.00
0.50	0.30	0.20	0.500	0.300	0.200	0.835	0.835	835.00	835.00	1000.00	0.00	0.00

Table D.5a: (continued)

s_{01}	s_{02}	s_{03}	$\overline{s_1^*}$	$\overline{s_2^*}$	$\overline{s_3^*}$	$r(\underline{s}_0)$	$\overline{r(\underline{s}^*)}$	V_0	$\overline{V^*}$	$\lfloor B^* \rfloor$	$\overline{D^*}$	$\overline{T^*}$
0.40	0.30	0.30	0.400	0.300	0.300	0.845	0.845	845.00	845.00	1000.00	0.00	0.00
0.30	0.30	0.40	0.300	0.300	0.400	0.855	0.855	855.00	855.00	1000.00	0.00	0.00
0.20	0.30	0.50	0.200	0.300	0.500	0.865	0.865	865.00	865.00	1000.00	0.00	0.00
0.10	0.30	0.60	0.100	0.300	0.600	0.875	0.875	875.00	875.00	1000.00	0.00	0.00
0.00	0.30	0.70	0.000	0.300	0.700	0.885	0.885	885.00	885.00	1000.00	0.00	0.00
0.60	0.40	0.00	0.600	0.400	0.000	0.820	0.820	820.00	820.00	1000.00	0.00	0.00
0.50	0.40	0.10	0.500	0.400	0.100	0.830	0.830	830.00	830.00	1000.00	0.00	0.00
0.40	0.40	0.20	0.400	0.400	0.200	0.840	0.840	840.00	840.00	1000.00	0.00	0.00
0.30	0.40	0.30	0.300	0.400	0.300	0.850	0.850	850.00	850.00	1000.00	0.00	0.00
0.20	0.40	0.40	0.200	0.400	0.400	0.860	0.860	860.00	860.00	1000.00	0.00	0.00
0.10	0.40	0.50	0.100	0.400	0.500	0.870	0.870	870.00	870.00	1000.00	0.00	0.00
0.00	0.40	0.60	0.000	0.400	0.600	0.880	0.880	880.00	880.00	1000.00	0.00	0.00
0.50	0.50	0.00	0.500	0.500	0.000	0.825	0.825	825.00	825.00	1000.00	0.00	0.00
0.40	0.50	0.10	0.400	0.500	0.100	0.835	0.835	835.00	835.00	1000.00	0.00	0.00
0.30	0.50	0.20	0.300	0.500	0.200	0.845	0.845	845.00	845.00	1000.00	0.00	0.00
0.20	0.50	0.30	0.200	0.500	0.300	0.855	0.855	855.00	855.00	1000.00	0.00	0.00
0.10	0.50	0.40	0.100	0.500	0.400	0.865	0.865	865.00	865.00	1000.00	0.00	0.00
0.00	0.50	0.50	0.000	0.500	0.500	0.875	0.875	875.00	875.00	1000.00	0.00	0.00
0.40	0.60	0.00	0.400	0.600	0.000	0.830	0.830	830.00	830.00	1000.00	0.00	0.00
0.30	0.60	0.10	0.300	0.600	0.100	0.840	0.840	840.00	840.00	1000.00	0.00	0.00
0.20	0.60	0.20	0.200	0.600	0.200	0.850	0.850	850.00	850.00	1000.00	0.00	0.00
0.10	0.60	0.30	0.100	0.600	0.300	0.860	0.860	860.00	860.00	1000.00	0.00	0.00
0.00	0.60	0.40	0.000	0.600	0.400	0.870	0.870	870.00	870.00	1000.00	0.00	0.00
0.30	0.70	0.00	0.300	0.700	0.000	0.835	0.835	835.00	835.00	1000.00	0.00	0.00
0.20	0.70	0.10	0.200	0.700	0.100	0.845	0.845	845.00	845.00	1000.00	0.00	0.00
0.10	0.70	0.20	0.100	0.700	0.200	0.855	0.855	855.00	855.00	1000.00	0.00	0.00
0.00	0.70	0.30	0.000	0.700	0.300	0.865	0.865	865.00	865.00	1000.00	0.00	0.00
0.20	0.80	0.00	0.200	0.800	0.000	0.840	0.840	840.00	840.00	1000.00	0.00	0.00
0.10	0.80	0.10	0.100	0.800	0.100	0.850	0.850	850.00	850.00	1000.00	0.00	0.00
0.00	0.80	0.20	0.000	0.800	0.200	0.860	0.860	860.00	860.00	1000.00	0.00	0.00
0.10	0.90	0.00	0.100	0.900	0.000	0.845	0.845	845.00	845.00	1000.00	0.00	0.00
0.00	0.90	0.10	0.000	0.900	0.100	0.855	0.855	855.00	855.00	1000.00	0.00	0.00
0.00	1.00	0.00	0.000	1.000	0.000	0.850	0.850	850.00	850.00	1000.00	0.00	0.00

Table D.5b: Simulation Results for the Set of Parameters: $n = 1{,}000$, $t = 5, d = 5$, $\underline{u}_a(g = 0.05, f = 0.25)$, and $\underline{r} = (0.80, 0.85, 0.90)$

s_{01}	s_{02}	s_{03}	F	$\bar{s}_{3grw}$	$\bar{r}_{grw}$	$\overline{V}_{grw}$	$\overline{DevC}$	$\frac{\overline{V}_{grw}}{\overline{DevC}}$	$\frac{\overline{DevC}}{n}\%$	$\frac{\overline{V^*}}{V_0}$
1.00	0.00	0.00	3.0	0.153	0.022	14.00	10.00	1.40	1.00	1.02
0.90	0.00	0.10	3.0	0.036	0.011	6.58	5.00	1.32	0.50	1.01
0.80	0.00	0.20	1.0	0.000	0.000	-0.00	0.00	0.00	0.00	1.00
0.70	0.00	0.30	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.60	0.00	0.40	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.50	0.00	0.50	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.40	0.00	0.60	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.30	0.00	0.70	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.20	0.00	0.80	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.10	0.00	0.90	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.00	0.00	1.00	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.90	0.10	0.00	3.0	0.131	0.014	9.56	5.00	1.91	0.50	1.01
0.80	0.10	0.10	3.0	0.047	0.007	2.42	5.00	0.48	0.50	1.00
0.70	0.10	0.20	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.60	0.10	0.30	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.50	0.10	0.40	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.40	0.10	0.50	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.30	0.10	0.60	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.20	0.10	0.70	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.10	0.10	0.80	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.00	0.10	0.90	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.80	0.20	0.00	3.0	0.142	0.009	5.40	5.00	1.08	0.50	1.01
0.70	0.20	0.10	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.60	0.20	0.20	1.0	0.000	0.000	-0.00	0.00	0.00	0.00	1.00
0.50	0.20	0.30	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.40	0.20	0.40	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.30	0.20	0.50	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.20	0.20	0.60	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.10	0.20	0.70	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.00	0.20	0.80	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.70	0.30	0.00	3.0	0.154	0.005	1.24	5.00	0.25	0.50	1.00
0.60	0.30	0.10	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.50	0.30	0.20	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00

Table D.5b: (continued)

s_{01}	s_{02}	s_{03}	F	$\bar{s}_{3grw}$	$\bar{r}_{grw}$	$\overline{V}_{grw}$	$\overline{DevC}$	$\frac{\overline{V}_{grw}}{\overline{DevC}}$	$\frac{\overline{DevC}}{n}\%$	$\frac{\overline{V^*}}{V_0}$
0.40	0.30	0.30	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.30	0.30	0.40	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.20	0.30	0.50	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.10	0.30	0.60	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.00	0.30	0.70	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.60	0.40	0.00	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.50	0.40	0.10	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.40	0.40	0.20	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.30	0.40	0.30	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.20	0.40	0.40	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.10	0.40	0.50	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.00	0.40	0.60	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.50	0.50	0.00	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.40	0.50	0.10	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.30	0.50	0.20	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.20	0.50	0.30	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.10	0.50	0.40	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.00	0.50	0.50	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.40	0.60	0.00	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.30	0.60	0.10	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.20	0.60	0.20	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.10	0.60	0.30	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.00	0.60	0.40	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.30	0.70	0.00	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.20	0.70	0.10	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.10	0.70	0.20	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.00	0.70	0.30	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.20	0.80	0.00	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.10	0.80	0.10	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.00	0.80	0.20	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.10	0.90	0.00	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.00	0.90	0.10	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.00	1.00	0.00	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00

Table D.5c: Simulation Results for the Set of Parameters: $n = 1{,}000,\ t = 5, d = 5$, $\underline{u}_a(g = 0.05, f = 0.25)$, and $\underline{r} = (0.80, 0.85, 0.90)$

s_{01}	s_{02}	s_{03}	$SD(s_2^*)$	$SD(s_3^*)$	$SD(r(\underline{s}^*))$	$SD(V^*)$	$Min(B^*)$	$SD(B^*)$	$SD(D^*)$	$SD(T^*)$
1.00	0.00	0.00	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.90	0.00	0.10	0.00	0.00	0.00	0.00	995.00	0.00	0.00	0.00
0.80	0.00	0.20	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.70	0.00	0.30	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.60	0.00	0.40	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.50	0.00	0.50	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.40	0.00	0.60	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.30	0.00	0.70	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.20	0.00	0.80	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.10	0.00	0.90	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.00	0.00	1.00	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.90	0.10	0.00	0.00	0.00	0.00	0.00	995.00	0.00	0.00	0.00
0.80	0.10	0.10	0.00	0.00	0.00	0.00	995.00	0.00	0.00	0.00
0.70	0.10	0.20	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.60	0.10	0.30	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.50	0.10	0.40	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.40	0.10	0.50	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.30	0.10	0.60	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.20	0.10	0.70	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.10	0.10	0.80	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.00	0.10	0.90	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.80	0.20	0.00	0.00	0.00	0.00	0.00	995.00	0.00	0.00	0.00
0.70	0.20	0.10	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.60	0.20	0.20	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.50	0.20	0.30	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.40	0.20	0.40	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.30	0.20	0.50	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.20	0.20	0.60	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.10	0.20	0.70	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.00	0.20	0.80	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.70	0.30	0.00	0.00	0.00	0.00	0.00	995.00	0.00	0.00	0.00
0.60	0.30	0.10	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.50	0.30	0.20	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00

Table D.5c: (continued)

s_{01}	s_{02}	s_{03}	SD(s_2^*)	SD(s_3^*)	SD($r(\underline{s}^*)$)	SD(V^*)	Min(B^*)	SD(B^*)	SD(D^*)	SD(T^*)
0.40	0.30	0.30	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.30	0.30	0.40	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.20	0.30	0.50	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.10	0.30	0.60	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.00	0.30	0.70	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.60	0.40	0.00	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.50	0.40	0.10	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.40	0.40	0.20	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.30	0.40	0.30	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.20	0.40	0.40	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.10	0.40	0.50	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.00	0.40	0.60	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.50	0.50	0.00	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.40	0.50	0.10	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.30	0.50	0.20	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.20	0.50	0.30	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.10	0.50	0.40	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.00	0.50	0.50	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.40	0.60	0.00	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.30	0.60	0.10	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.20	0.60	0.20	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.10	0.60	0.30	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.00	0.60	0.40	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.30	0.70	0.00	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.20	0.70	0.10	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.10	0.70	0.20	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.00	0.70	0.30	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.20	0.80	0.00	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.10	0.80	0.10	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.00	0.80	0.20	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.10	0.90	0.00	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.00	0.90	0.10	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.00	1.00	0.00	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00

Table D.6a: Simulation Results for the Set of Parameters: $n = 1000$, $t = 5, d = 5$, $\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.80, 0.85, 0.90)$

s_{01}	s_{02}	s_{03}	$\overline{s_1^*}$	$\overline{s_2^*}$	$\overline{s_3^*}$	$r(\underline{s}_0)$	$\overline{r(\underline{s}^*)}$	V_0	$\overline{V^*}$	$\lfloor B^* \rfloor$	$\overline{D^*}$	$\overline{T^*}$
1.00	0.00	0.00	0.210	0.163	0.628	0.800	0.871	800.00	862.20	990.00	2.00	0.00
0.90	0.00	0.10	0.204	0.160	0.636	0.810	0.872	810.00	862.88	990.00	2.00	0.00
0.80	0.00	0.20	0.198	0.158	0.644	0.820	0.872	820.00	863.56	990.00	2.00	0.00
0.70	0.00	0.30	0.193	0.155	0.652	0.830	0.873	830.00	864.24	990.00	2.00	0.00
0.60	0.00	0.40	0.187	0.153	0.660	0.840	0.874	840.00	864.92	990.00	2.00	0.00
0.50	0.00	0.50	0.181	0.151	0.668	0.850	0.874	850.00	865.59	990.00	2.00	0.00
0.40	0.00	0.60	0.186	0.214	0.600	0.860	0.871	860.00	866.33	995.00	1.00	0.00
0.30	0.00	0.70	0.300	0.000	0.700	0.870	0.870	870.00	870.00	1000.00	0.00	0.00
0.20	0.00	0.80	0.200	0.000	0.800	0.880	0.880	880.00	880.00	1000.00	0.00	0.00
0.10	0.00	0.90	0.100	0.000	0.900	0.890	0.890	890.00	890.00	1000.00	0.00	0.00
0.00	0.00	1.00	0.000	0.000	1.000	0.900	0.900	900.00	900.00	1000.00	0.00	0.00
0.90	0.10	0.00	0.205	0.163	0.631	0.805	0.871	805.00	862.60	990.00	2.00	0.00
0.80	0.10	0.10	0.199	0.161	0.639	0.815	0.872	815.00	863.28	990.00	2.00	0.00
0.70	0.10	0.20	0.194	0.159	0.647	0.825	0.873	825.00	863.96	990.00	2.00	0.00
0.60	0.10	0.30	0.188	0.156	0.656	0.835	0.873	835.00	864.64	990.00	2.00	0.00
0.50	0.10	0.40	0.182	0.154	0.664	0.845	0.874	845.00	865.31	990.00	2.00	0.00
0.40	0.10	0.50	0.177	0.152	0.672	0.855	0.875	855.00	865.99	990.00	2.00	0.00
0.30	0.10	0.60	0.181	0.183	0.636	0.865	0.873	865.00	868.35	995.00	1.00	0.00
0.20	0.10	0.70	0.200	0.100	0.700	0.875	0.875	875.00	875.00	1000.00	0.00	0.00
0.10	0.10	0.80	0.100	0.100	0.800	0.885	0.885	885.00	885.00	1000.00	0.00	0.00
0.00	0.10	0.90	0.000	0.100	0.900	0.895	0.895	895.00	895.00	1000.00	0.00	0.00
0.80	0.20	0.00	0.201	0.164	0.635	0.810	0.872	810.00	863.00	990.00	2.00	0.00
0.70	0.20	0.10	0.195	0.162	0.643	0.820	0.872	820.00	863.68	990.00	2.00	0.00
0.60	0.20	0.20	0.189	0.160	0.651	0.830	0.873	830.00	864.36	990.00	2.00	0.00
0.50	0.20	0.30	0.184	0.157	0.659	0.840	0.874	840.00	865.03	990.00	2.00	0.00
0.40	0.20	0.40	0.178	0.155	0.667	0.850	0.874	850.00	865.71	990.00	2.00	0.00
0.30	0.20	0.50	0.193	0.176	0.631	0.860	0.872	860.00	867.51	995.00	1.00	0.00
0.20	0.20	0.60	0.176	0.153	0.671	0.870	0.875	870.00	870.37	995.00	1.00	0.00
0.10	0.20	0.70	0.100	0.200	0.700	0.880	0.880	880.00	880.00	1000.00	0.00	0.00
0.00	0.20	0.80	0.000	0.200	0.800	0.890	0.890	890.00	890.00	1000.00	0.00	0.00
0.70	0.30	0.00	0.196	0.165	0.639	0.815	0.872	815.00	863.40	990.00	2.00	0.00
0.60	0.30	0.10	0.190	0.163	0.647	0.825	0.873	825.00	864.08	990.00	2.00	0.00
0.50	0.30	0.20	0.185	0.161	0.655	0.835	0.873	835.00	864.75	990.00	2.00	0.00

Table D.6a: (continued)

s_{01}	s_{02}	s_{03}	$\overline{s_1^*}$	$\overline{s_2^*}$	$\overline{s_3^*}$	$r(\underline{s}_0)$	$\overline{r(\underline{s}^*)}$	V_0	$\overline{V^*}$	$\boxed{B^*}$	$\overline{D^*}$	$\overline{T^*}$
0.40	0.30	0.30	0.179	0.158	0.663	0.845	0.874	845.00	865.43	990.00	2.00	0.00
0.30	0.30	0.40	0.205	0.169	0.626	0.855	0.871	855.00	866.67	995.00	1.00	0.00
0.20	0.30	0.50	0.188	0.146	0.666	0.865	0.874	865.00	869.53	995.00	1.00	0.00
0.10	0.30	0.60	0.100	0.300	0.600	0.875	0.875	875.00	875.00	1000.00	0.00	0.00
0.00	0.30	0.70	0.000	0.300	0.700	0.885	0.885	885.00	885.00	1000.00	0.00	0.00
0.60	0.40	0.00	0.192	0.166	0.642	0.820	0.873	820.00	863.79	990.00	2.00	0.00
0.50	0.40	0.10	0.186	0.164	0.650	0.830	0.873	830.00	864.47	990.00	2.00	0.00
0.40	0.40	0.20	0.180	0.162	0.658	0.840	0.874	840.00	865.15	990.00	2.00	0.00
0.30	0.40	0.30	0.217	0.163	0.621	0.850	0.870	850.00	865.83	995.00	1.00	0.00
0.20	0.40	0.40	0.200	0.139	0.661	0.860	0.873	860.00	868.69	995.00	1.00	0.00
0.10	0.40	0.50	0.183	0.115	0.702	0.870	0.876	870.00	871.55	995.00	1.00	0.00
0.00	0.40	0.60	0.000	0.400	0.600	0.880	0.880	880.00	880.00	1000.00	0.00	0.00
0.50	0.50	0.00	0.187	0.167	0.646	0.825	0.873	825.00	864.19	990.00	2.00	0.00
0.40	0.50	0.10	0.182	0.165	0.654	0.835	0.874	835.00	864.87	990.00	2.00	0.00
0.30	0.50	0.20	0.176	0.162	0.662	0.845	0.874	845.00	865.55	990.00	2.00	0.00
0.20	0.50	0.30	0.212	0.132	0.656	0.855	0.872	855.00	867.85	995.00	1.00	0.00
0.10	0.50	0.40	0.195	0.108	0.697	0.865	0.875	865.00	870.72	995.00	1.00	0.00
0.00	0.50	0.50	0.000	0.500	0.500	0.875	0.875	875.00	875.00	1000.00	0.00	0.00
0.40	0.60	0.00	0.183	0.168	0.649	0.830	0.873	830.00	864.59	990.00	2.00	0.00
0.30	0.60	0.10	0.177	0.166	0.657	0.840	0.874	840.00	865.27	990.00	2.00	0.00
0.20	0.60	0.20	0.224	0.125	0.651	0.850	0.871	850.00	867.02	995.00	1.00	0.00
0.10	0.60	0.30	0.207	0.101	0.692	0.860	0.874	860.00	869.88	995.00	1.00	0.00
0.00	0.60	0.40	0.190	0.078	0.732	0.870	0.877	870.00	872.74	995.00	1.00	0.00
0.30	0.70	0.00	0.178	0.169	0.653	0.835	0.874	835.00	864.99	990.00	2.00	0.00
0.20	0.70	0.10	0.236	0.118	0.646	0.845	0.871	845.00	866.18	995.00	1.00	0.00
0.10	0.70	0.20	0.219	0.094	0.687	0.855	0.873	855.00	869.04	995.00	1.00	0.00
0.00	0.70	0.30	0.202	0.071	0.727	0.865	0.876	865.00	871.90	995.00	1.00	0.00
0.20	0.80	0.00	0.247	0.111	0.641	0.840	0.870	840.00	865.34	995.00	1.00	0.00
0.10	0.80	0.10	0.231	0.088	0.682	0.850	0.873	850.00	868.20	995.00	1.00	0.00
0.00	0.80	0.20	0.214	0.064	0.722	0.860	0.875	860.00	871.06	995.00	1.00	0.00
0.10	0.90	0.00	0.243	0.081	0.677	0.845	0.872	845.00	867.36	995.00	1.00	0.00
0.00	0.90	0.10	0.226	0.057	0.717	0.855	0.875	855.00	870.22	995.00	1.00	0.00
0.00	1.00	0.00	0.238	0.050	0.712	0.850	0.874	850.00	869.38	995.00	1.00	0.00

Table D.6b: Simulation Results for the Set of Parameters: $n = 1{,}000$, $t = 5, d = 5$, $\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.80, 0.85, 0.90)$

s_{01}	s_{02}	s_{03}	F	$\overline{s}_{3grw}$	$\overline{r}_{grw}$	$\overline{V}_{grw}$	$\overline{DevC}$	$\frac{\overline{V}_{grw}}{\overline{DevC}}$	$\frac{\overline{DevC}}{n}\%$	$\frac{\overline{V^*}}{V_0}$
1.00	0.00	0.00	3.0	0.628	0.071	62.20	10.00	6.22	1.00	1.08
0.90	0.00	0.10	3.0	0.536	0.062	52.88	10.00	5.29	1.00	1.07
0.80	0.00	0.20	3.0	0.444	0.052	43.56	10.00	4.36	1.00	1.05
0.70	0.00	0.30	3.0	0.352	0.043	34.24	10.00	3.42	1.00	1.04
0.60	0.00	0.40	3.0	0.260	0.034	24.92	10.00	2.49	1.00	1.03
0.50	0.00	0.50	3.0	0.168	0.024	15.59	10.00	1.56	1.00	1.02
0.40	0.00	0.60	3.0	0.000	0.011	6.33	5.00	1.27	0.50	1.01
0.30	0.00	0.70	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.20	0.00	0.80	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.10	0.00	0.90	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.00	0.00	1.00	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.90	0.10	0.00	3.0	0.631	0.066	57.60	10.00	5.76	1.00	1.07
0.80	0.10	0.10	3.0	0.539	0.057	48.28	10.00	4.83	1.00	1.06
0.70	0.10	0.20	3.0	0.447	0.048	38.96	10.00	3.90	1.00	1.05
0.60	0.10	0.30	3.0	0.356	0.038	29.64	10.00	2.96	1.00	1.04
0.50	0.10	0.40	3.0	0.264	0.029	20.31	10.00	2.03	1.00	1.02
0.40	0.10	0.50	3.0	0.172	0.020	10.99	10.00	1.10	1.00	1.01
0.30	0.10	0.60	3.0	0.036	0.008	3.35	5.00	0.67	0.50	1.00
0.20	0.10	0.70	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.10	0.10	0.80	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.00	0.10	0.90	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.80	0.20	0.00	3.0	0.635	0.062	53.00	10.00	5.30	1.00	1.07
0.70	0.20	0.10	3.0	0.543	0.052	43.68	10.00	4.37	1.00	1.05
0.60	0.20	0.20	3.0	0.451	0.043	34.36	10.00	3.44	1.00	1.04
0.50	0.20	0.30	3.0	0.359	0.034	25.03	10.00	2.50	1.00	1.03
0.40	0.20	0.40	3.0	0.267	0.024	15.71	10.00	1.57	1.00	1.02
0.30	0.20	0.50	3.0	0.131	0.012	7.51	5.00	1.50	0.50	1.01
0.20	0.20	0.60	3.0	0.071	0.005	0.37	5.00	0.07	0.50	1.00
0.10	0.20	0.70	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.00	0.20	0.80	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.70	0.30	0.00	3.0	0.639	0.057	48.40	10.00	4.84	1.00	1.06
0.60	0.30	0.10	3.0	0.547	0.048	39.08	10.00	3.91	1.00	1.05
0.50	0.30	0.20	3.0	0.455	0.038	29.75	10.00	2.98	1.00	1.04

Table D.6b: (continued)

s_{01}	s_{02}	s_{03}	F	$\bar{s}_{3grw}$	$\bar{r}_{grw}$	$\bar{V}_{grw}$	$\overline{DevC}$	$\frac{\bar{V}_{grw}}{\overline{DevC}}$	$\frac{\overline{DevC}}{n}\%$	$\frac{\overline{V^*}}{V_0}$
0.40	0.30	0.30	3.0	0.363	0.029	20.43	10.00	2.04	1.00	1.02
0.30	0.30	0.40	3.0	0.226	0.016	11.67	5.00	2.33	0.50	1.01
0.20	0.30	0.50	3.0	0.166	0.009	4.53	5.00	0.91	0.50	1.01
0.10	0.30	0.60	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.00	0.30	0.70	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.60	0.40	0.00	3.0	0.642	0.053	43.79	10.00	4.38	1.00	1.05
0.50	0.40	0.10	3.0	0.550	0.043	34.47	10.00	3.45	1.00	1.04
0.40	0.40	0.20	3.0	0.458	0.034	25.15	10.00	2.52	1.00	1.03
0.30	0.40	0.30	3.0	0.321	0.020	15.83	5.00	3.17	0.50	1.02
0.20	0.40	0.40	3.0	0.261	0.013	8.69	5.00	1.74	0.50	1.01
0.10	0.40	0.50	3.0	0.202	0.006	1.55	5.00	0.31	0.50	1.00
0.00	0.40	0.60	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.50	0.50	0.00	3.0	0.646	0.048	39.19	10.00	3.92	1.00	1.05
0.40	0.50	0.10	3.0	0.554	0.039	29.87	10.00	2.99	1.00	1.04
0.30	0.50	0.20	3.0	0.462	0.029	20.55	10.00	2.05	1.00	1.02
0.20	0.50	0.30	3.0	0.356	0.017	12.85	5.00	2.57	0.50	1.02
0.10	0.50	0.40	3.0	0.297	0.010	5.72	5.00	1.14	0.50	1.01
0.00	0.50	0.50	1.0	0.000	0.000	0.00	0.00	0.00	0.00	1.00
0.40	0.60	0.00	3.0	0.649	0.043	34.59	10.00	3.46	1.00	1.04
0.30	0.60	0.10	3.0	0.557	0.034	25.27	10.00	2.53	1.00	1.03
0.20	0.60	0.20	3.0	0.451	0.021	17.02	5.00	3.40	0.50	1.02
0.10	0.60	0.30	3.0	0.392	0.014	9.88	5.00	1.98	0.50	1.01
0.00	0.60	0.40	3.0	0.332	0.007	2.74	5.00	0.55	0.50	1.00
0.30	0.70	0.00	3.0	0.653	0.039	29.99	10.00	3.00	1.00	1.04
0.20	0.70	0.10	3.0	0.546	0.026	21.18	5.00	4.24	0.50	1.03
0.10	0.70	0.20	3.0	0.487	0.018	14.04	5.00	2.81	0.50	1.02
0.00	0.70	0.30	3.0	0.427	0.011	6.90	5.00	1.38	0.50	1.01
0.20	0.80	0.00	3.0	0.641	0.030	25.34	5.00	5.07	0.50	1.03
0.10	0.80	0.10	3.0	0.582	0.023	18.20	5.00	3.64	0.50	1.02
0.00	0.80	0.20	3.0	0.522	0.015	11.06	5.00	2.21	0.50	1.01
0.10	0.90	0.00	3.0	0.677	0.027	22.36	5.00	4.47	0.50	1.03
0.00	0.90	0.10	3.0	0.617	0.020	15.22	5.00	3.04	0.50	1.02
0.00	1.00	0.00	3.0	0.712	0.024	19.38	5.00	3.88	0.50	1.02

Table D.6c: Simulation Results for the Set of Parameters: $n = 1000$, $t = 5, d = 5$, $\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.80, 0.85, 0.90)$

s_{01}	s_{02}	s_{03}	SD(s_2^*)	SD(s_3^*)	SD$(r(\underline{s}^*))$	SD(V^*)	Min(B^*)	SD(B^*)	SD(D^*)	SD(T^*)
1.00	0.00	0.00	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.90	0.00	0.10	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.80	0.00	0.20	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.70	0.00	0.30	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.60	0.00	0.40	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.50	0.00	0.50	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.40	0.00	0.60	0.00	0.00	0.00	0.00	995.00	0.00	0.00	0.00
0.30	0.00	0.70	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.20	0.00	0.80	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.10	0.00	0.90	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.00	0.00	1.00	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.90	0.10	0.00	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.80	0.10	0.10	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.70	0.10	0.20	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.60	0.10	0.30	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.50	0.10	0.40	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.40	0.10	0.50	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.30	0.10	0.60	0.00	0.00	0.00	0.00	995.00	0.00	0.00	0.00
0.20	0.10	0.70	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.10	0.10	0.80	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.00	0.10	0.90	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.80	0.20	0.00	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.70	0.20	0.10	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.60	0.20	0.20	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.50	0.20	0.30	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.40	0.20	0.40	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.30	0.20	0.50	0.00	0.00	0.00	0.00	995.00	0.00	0.00	0.00
0.20	0.20	0.60	0.00	0.00	0.00	0.00	995.00	0.00	0.00	0.00
0.10	0.20	0.70	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.00	0.20	0.80	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.70	0.30	0.00	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.60	0.30	0.10	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.50	0.30	0.20	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00

Table D.6c: (continued)

s_{01}	s_{02}	s_{03}	SD (s_2^*)	SD (s_3^*)	SD $(r(\underline{s}^*)$	SD (V^*)	Min (B^*)	SD (B^*)	SD (D^*)	SD (T^*)
0.40	0.30	0.30	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.30	0.30	0.40	0.00	0.00	0.00	0.00	995.00	0.00	0.00	0.00
0.20	0.30	0.50	0.00	0.00	0.00	0.00	995.00	0.00	0.00	0.00
0.10	0.30	0.60	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.00	0.30	0.70	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.60	0.40	0.00	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.50	0.40	0.10	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.40	0.40	0.20	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.30	0.40	0.30	0.00	0.00	0.00	0.00	995.00	0.00	0.00	0.00
0.20	0.40	0.40	0.00	0.00	0.00	0.00	995.00	0.00	0.00	0.00
0.10	0.40	0.50	0.00	0.00	0.00	0.00	995.00	0.00	0.00	0.00
0.00	0.40	0.60	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.50	0.50	0.00	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.40	0.50	0.10	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.30	0.50	0.20	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.20	0.50	0.30	0.00	0.00	0.00	0.00	995.00	0.00	0.00	0.00
0.10	0.50	0.40	0.00	0.00	0.00	0.00	995.00	0.00	0.00	0.00
0.00	0.50	0.50	0.00	0.00	0.00	0.00	1000.00	0.00	0.00	0.00
0.40	0.60	0.00	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.30	0.60	0.10	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.20	0.60	0.20	0.00	0.00	0.00	0.00	995.00	0.00	0.00	0.00
0.10	0.60	0.30	0.00	0.00	0.00	0.00	995.00	0.00	0.00	0.00
0.00	0.60	0.40	0.00	0.00	0.00	0.00	995.00	0.00	0.00	0.00
0.30	0.70	0.00	0.00	0.00	0.00	0.00	990.00	0.00	0.00	0.00
0.20	0.70	0.10	0.00	0.00	0.00	0.00	995.00	0.00	0.00	0.00
0.10	0.70	0.20	0.00	0.00	0.00	0.00	995.00	0.00	0.00	0.00
0.00	0.70	0.30	0.00	0.00	0.00	0.00	995.00	0.00	0.00	0.00
0.20	0.80	0.00	0.00	0.00	0.00	0.00	995.00	0.00	0.00	0.00
0.10	0.80	0.10	0.00	0.00	0.00	0.00	995.00	0.00	0.00	0.00
0.00	0.80	0.20	0.00	0.00	0.00	0.00	995.00	0.00	0.00	0.00
0.10	0.90	0.00	0.00	0.00	0.00	0.00	995.00	0.00	0.00	0.00
0.00	0.90	0.10	0.00	0.00	0.00	0.00	995.00	0.00	0.00	0.00
0.00	1.00	0.00	0.00	0.00	0.00	0.00	995.00	0.00	0.00	0.00

APPENDIX E. SIMULATION RESULTS FOR THE MODELS ALLOWING ACCELERATED TESTING

For $r = (0.80, 0.85, 0.90)$ and $n = 1{,}000$

Table E.1: $\underline{u}_b(g = 0.05, f = 0.75), t = 5$ and $d = 5$

Table E.2: $\underline{u}_b(g = 0.05, f = 0.75), t = 5$ and $d = 10$

Table E.3: $\underline{u}_b(g = 0.05, f = 0.75), t = 5$ and $d = 50$

Table E.4: $\underline{u}_a(g = 0.05, f = 0.25), t = 2.5$ and $d = 5$

Table E.5: $\underline{u}_b(g = 0.05, f = 0.75), t = 2.5$ and $d = 5$

Table E.6: $\underline{u}_c(g = 0.05, f = 1.00), t = 2.5$ and $d = 5$

For $r = (0.900, 0.945, 0.990)$ and $n = 1{,}000$

Table E.7: $\underline{u}_b(g = 0.05, f = 0.75), t = 5$ and $d = 5$

Table E.8: $\underline{u}_b(g = 0.05, f = 0.75), t = 5$ and $d = 10$

Table E.9: $\underline{u}_b(g = 0.05, f = 0.75), t = 5$ and $d = 50$

Table E.10: $\underline{u}_a(g = 0.05, f = 0.25), t = 2.5$ and $d = 5$

Table E.11: $\underline{u}_b(g = 0.05, f = 0.75), t = 2.5$ and $d = 5$

Table E.12: $\underline{u}_c(g = 0.05, f = 1.00), t = 2.5$ and $d = 5$

Table E.1a: Simulation Results for the Set of Parameters: $n = 1000$, $t = 5, d = 5$, $\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.80, 0.85, 0.90)$

(s_{01}, s_{02}, s_{03})	F			$\overline{D^*}$			$\overline{T^*}$		
	$a_f = 1$	$a_f = 2.5$	$a_f = 5$	$a_f = 1$	$a_f = 2.5$	$a_f = 5$	$a_f = 1$	$a_f = 2.5$	$a_f = 5$
(1.00.0.00,0.00)	3	3	3	2.00	2.00	3.10	0.00	0.00	3.03
(0.90.0.00,0.10)	3	3	3	2.00	2.00	3.09	0.00	0.00	3.01
(0.80.0.00,0.20)	3	3	3	2.00	2.00	3.08	0.00	0.00	2.99
(0.70,0.00,0.30)	3	3	2	2.00	2.00	2.58	0.00	0.00	3.50
(0.60,0.00,0.40)	3	3	2	2.00	2.00	2.42	0.00	0.00	3.34
(0.50,0.00,0.50)	3	3	2	2.00	2.00	1.89	0.00	0.00	3.59
(0.40,0.00,0.60)	3	3	2	1.00	1.00	1.66	0.00	0.00	3.31
(0.30,0.00,0.70)	1	1	2	0.00	0.00	1.16	0.00	0.00	3.24
(0.20,0.00,0.80)	1	1	2	0.00	0.00	0.75	0.00	0.00	3.02
(0.10,0.00,0.90)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.00,1.00)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.90,0.10,0.00)	3	3	3	2.00	2.00	3.09	0.00	0.00	3.02
(0.80,0.10,0.10)	3	3	3	2.00	2.00	3.08	0.00	0.00	3.00
(0.70,0.10,0.20)	3	3	3	2.00	2.00	2.47	0.00	0.00	3.12
(0.60,0.10,0.30)	3	3	3	2.00	2.00	2.43	0.00	0.00	3.06
(0.50,0.10,0.40)	3	3	2	2.00	2.00	1.89	0.00	0.00	3.39
(0.40,0.10,0.50)	3	3	2	2.00	2.00	1.74	0.00	0.00	3.19
(0.30,0.10.0.60)	3	3	2	1.00	1.00	1.21	0.00	0.00	3.19
(0.20,0.10,0.70)	1	1	2	0.00	0.00	0.79	0.00	0.00	3.04
(0.10,0.10,0.80)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.10,0.90)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.80,0.20,0.00)	3	3	3	2.00	2.00	3.09	0.00	0.00	3.01
(0.70,0.20,0.10)	3	3	3	2.00	2.00	3.07	0.00	0.00	2.99
(0.60,0.20,0.20)	3	3	3	2.00	2.00	2.44	0.00	0.00	3.08
(0.50,0.20,0.30)	3	3	3	2.00	2.00	2.40	0.00	0.00	3.02
(0.40,0.20,0.40)	3	3	3	2.00	2.00	2.12	0.00	0.00	3.06
(0.30,0.20,0.50)	3	3	2	1.00	1.00	1.65	0.00	0.00	3.07
(0.20,0.20,0.60)	3	3	2	1.00	1.00	1.08	0.00	0.00	3.00
(0.10,0.20,0.70)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.20,0.80)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.70,0.30,0.00)	3	3	3	2.00	2.00	3.08	0.00	0.00	3.00
(0.60,0.30,0.10)	3	3	3	2.00	2.00	2.46	0.00	0.00	3.10
(0.50,0.30,0.20)	3	3	3	2.00	2.00	2.42	0.00	0.00	3.04

Table E.1a: (continued)

(s_{01}, s_{02}, s_{03})	F			$\overline{R^*}$			$\overline{T^*}$		
	$a_f=1$	$a_f=2.5$	$a_f=5$	$a_f=1$	$a_f=2.5$	$a_f=5$	$a_f=1$	$a_f=2.5$	$a_f=5$
(0.40,0.30,0.30)	3	3	3	2.00	2.00	2.14	0.00	0.00	3.09
(0.30,0.30,0.40)	3	3	3	1.00	1.00	2.09	0.00	0.00	3.01
(0.20,0.30,0.50)	3	3	2	1.00	1.00	1.40	0.00	0.00	3.02
(0.10,0.30,0.60)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.30,0.70)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.60,0.40,0.00)	3	3	3	2.00	2.00	2.47	0.00	0.00	3.12
(0.50,0.40,0.10)	3	3	3	2.00	2.00	2.43	0.00	0.00	3.06
(0.40,0.40,0.20)	3	3	3	2.00	2.00	2.16	0.00	0.00	3.13
(0.30,0.40,0.30)	3	3	3	1.00	1.00	2.11	0.00	0.00	3.04
(0.20,0.40,0.40)	3	3	3	1.00	1.00	2.05	0.00	0.00	2.96
(0.10,0.40,0.50)	3	3	3	1.00	1.00	1.78	0.00	0.00	3.03
(0.00,0.40,0.60)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.50,0.50,0.00)	3	3	3	2.00	2.00	2.45	0.00	0.00	3.09
(0.40,0.50,0.10)	3	3	3	2.00	2.00	2.18	0.00	0.00	3.15
(0.30,0.50,0.20)	3	3	3	2.00	2.00	2.13	0.00	0.00	3.07
(0.20,0.50,0.30)	3	3	3	1.00	1.00	2.07	0.00	0.00	2.99
(0.10,0.50,0.40)	3	3	3	1.00	1.00	1.80	0.00	0.00	3.07
(0.00,0.50,0.50)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.40,0.60,0.00)	3	3	3	2.00	2.00	2.20	0.00	0.00	3.18
(0.30,0.60,0.10)	3	3	3	2.00	2.00	2.15	0.00	0.00	3.10
(0.20,0.60,0.20)	3	3	3	1.00	1.00	2.09	0.00	0.00	3.02
(0.10,0.60,0.30)	3	3	3	1.00	1.00	1.82	0.00	0.00	3.11
(0.00,0.60,0.40)	3	3	3	1.00	1.00	1.77	0.00	0.00	3.00
(0.30,0.70,0.00)	3	3	3	2.00	2.00	2.17	0.00	0.00	3.13
(0.20,0.70,0.10)	3	3	3	1.00	1.00	2.11	0.00	0.00	3.05
(0.10,0.70,020)	3	3	3	1.00	1.00	1.85	0.00	0.00	3.15
(0.00,0.70,0.30)	3	3	3	1.00	1.00	1.79	0.00	0.00	3.04
(0.20,0.80,0.00)	3	3	3	1.00	1.00	2.13	0.00	0.00	3.08
(0.10,0.80,0.10)	3	3	3	1.00	1.00	1.87	0.00	0.00	3.19
(0.00,0.80,0.20)	3	3	3	1.00	1.00	1.81	0.00	0.00	3.08
(0.10,0.90,0.00)	3	3	3	1.00	1.00	1.90	0.00	0.00	3.24
(0.00,0.90,0.10)	3	3	3	1.00	1.00	1.84	0.00	0.00	3.12
(0.00,1.00,0.00)	3	3	3	1.00	1.00	1.86	0.00	0.00	3.17

Table E.1b: Simulation Results for the Set of Parameters: $n = 1000,\ t = 5, d = 5,$
$\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.80,0.85,0.90)$

(s_{01}, s_{02}, s_{03})	$\overline{s_3^* - s_{03}}$			$r(\underline{s}_0)$	$\overline{r(\underline{s}^*) - r(\underline{s}_0)}$			V_0	$\overline{V^* - V_0}$		
	a_f				a_f				a_f		
	1.0	2.5	5.0		1.0	2.5	5.0		1.0	2.5	5.0
(1.00,0.00,0.00)	0.628	0.628	0.859	0.800	0.071	0.071	0.093	800.00	62.20	62.20	65.59
(0.90,0.00,0.10)	0.536	0.536	0.762	0.810	0.062	0.062	0.083	810.00	52.88	52.88	55.86
(0.80,0.00,0.20)	0.444	0.444	0.664	0.820	0.052	0.052	0.073	820.00	43.56	43.56	46.10
(0.70,0.00,0.30)	0.352	0.352	0.584	0.830	0.043	0.043	0.064	830.00	34.24	34.24	37.03
(0.60,0.00,0.40)	0.260	0.260	0.493	0.840	0.034	0.034	0.055	840.00	24.92	24.92	28.91
(0.50,0.00,0.50)	0.168	0.168	0.416	0.850	0.024	0.024	0.046	850.00	15.59	15.59	21.33
(0.40,0.00,0.60)	0.000	0.000	0.327	0.860	0.011	0.011	0.036	860.00	6.33	6.33	14.14
(0.30,0.00,0.70)	0.000	0.000	0.248	0.870	0.000	0.000	0.027	870.00	0.00	0.00	7.71
(0.20,0.00,0.80)	0.000	0.000	0.167	0.880	0.000	0.000	0.018	880.00	0.00	0.00	1.43
(0.10,0.00,0.90	0.000	0.000	0.000	0.890	0.000	0.000	0.000	890.00	0.00	0.00	0.00
(0.00,0.00,1.00)	0.000	0.000	0.000	0.900	0.000	0.000	0.000	900.00	0.00	0.00	0.00
(0.90,0.10,0.00)	0.631	0.631	0.860	0.805	0.066	0.066	0.088	805.00	57.60	57.60	60.71
(0.80,0.10,0.10)	0.539	0.539	0.762	0.815	0.057	0.057	0.078	815.00	48.28	48.28	50.96
(0.70,0.10,0.20)	0.447	0.447	0.625	0.825	0.048	0.048	0.066	825.00	38.96	38.96	41.33
(0.60,0.10,0.30)	0.356	0.356	0.535	0.835	0.038	0.038	0.057	835.00	29.64	29.64	32.27
(0.50,0.10,0.40)	0.264	0.264	0.444	0.845	0.029	0.029	0.047	845.00	20.31	20.31	23.69
(0.40,0.10,0.50)	0.172	0.172	0.359	0.855	0.020	0.020	0.038	855.00	10.99	10.99	16.00
(0.30,0.10,0.60)	0.036	0.036	0.273	0.865	0.008	0.008	0.029	865.00	3.35	3.35	9.06
(0.20,0.10,0.70)	0.000	0.000	0.188	0.875	0.000	0.000	0.019	875.00	0.00	0.00	2.31
(0.10,0.10,0.80)	0.000	0.000	0.000	0.885	0.000	0.000	0.000	885.00	0.00	0.00	0.00
(0.00,0.10,0.90)	0.000	0.000	0.000	0.895	0.000	0.000	0.000	895.00	0.00	0.00	0.00
(0.80,0.20,0.00)	0.635	0.635	0.860	0.810	0.062	0.062	0.083	810.00	53.00	53.00	55.81
(0.70,0.20,0.10)	0.543	0.543	0.762	0.820	0.052	0.052	0.073	820.00	43.68	43.68	46.05
(0.60,0.20,0.20)	0.451	0.451	0.635	0.830	0.043	0.043	0.062	830.00	34.36	34.36	37.09
(0.50,0.20,0.30)	0.359	0.359	0.544	0.840	0.034	0.034	0.052	840.00	25.03	25.03	28.00
(0.40,0.20,0.40)	0.267	0.267	0.441	0.850	0.024	0.024	0.042	850.00	15.71	15.71	18.94
(0.30,0.20,0.50)	0.131	0.131	0.346	0.860	0.012	0.012	0.032	860.00	7.51	7.51	11.23
(0.20,0.20,0.60)	0.071	0.071	0.243	0.870	0.005	0.005	0.022	870.00	0.37	0.37	3.94
(0.10,0.20,0.70)	0.000	0.000	0.000	0.880	0.000	0.000	0.000	880.00	0.00	0.00	0.00
(0.00,0.20,0.80)	0.000	0.000	0.000	0.890	0.000	0.000	0.000	890.00	0.00	0.00	0.00
(0.70,0.30,0.00)	0.639	0.639	0.860	0.815	0.057	0.057	0.078	815.00	48.40	48.40	50.91
(0.60,0.30,0.10)	0.547	0.547	0.734	0.825	0.048	0.048	0.067	825.00	39.08	39.08	41.92
(0.50,0.30,0.20)	0.455	0.455	0.644	0.835	0.038	0.038	0.057	835.00	29.75	29.75	32.82

Table E.1b: (continued)

(s_{01}, s_{02}, s_{03})	$\overline{s_3^* - s_{03}}$			$r(\underline{s}_0)$	$\overline{r(\underline{s}^*) - r(\underline{s}_0)}$			V_0	$\overline{V^* - V_0}$		
	a_f				a_f				a_f		
	1.0	2.5	5.0		1.0	2.5	5.0		1.0	2.5	5.0
(0.40,0.30,0.30)	0.363	0.363	0.543	0.845	0.029	0.029	0.047	845.00	20.43	20.43	23.78
(0.30,0.30,0.40)	0.226	0.226	0.457	0.855	0.016	0.016	0.038	855.00	11.67	11.67	15.09
(0.20,0.30,0.50)	0.166	0.166	0.328	0.865	0.009	0.009	0.026	865.00	4.53	4.53	6.70
(0.10,0.30,0.60)	0.000	0.000	0.000	0.875	0.000	0.000	0.000	875.00	0.00	0.00	0.00
(0.00,0.30,0.70)	0.000	0.000	0.000	0.885	0.000	0.000	0.000	885.00	0.00	0.00	0.00
(0.60,0.40,0.00)	0.642	0.642	0.834	0.820	0.053	0.053	0.072	820.00	43.79	43.79	46.73
(0.50,0.40,0.10)	0.550	0.550	0.743	0.830	0.043	0.043	0.062	830.00	34.47	34.47	37.64
(0.40,0.40,0.20)	0.458	0.458	0.644	0.840	0.034	0.034	0.052	840.00	25.15	25.15	28.60
(0.30,0.40,0.30)	0.321	0.321	0.558	0.850	0.020	0.020	0.043	850.00	15.83	15.83	19.93
(0.20,0.40,0.40)	0.261	0.261	0.472	0.860	0.013	0.013	0.034	860.00	8.69	8.69	11.23
(0.10,0.40,0.50)	0.202	0.202	0.381	0.870	0.006	0.006	0.024	870.00	1.55	1.55	2.62
(0.00,0.40,0.60)	0.000	0.000	0.000	0.880	0.000	0.000	0.000	880.00	0.00	0.00	0.00
(0.50,0.50,0.00)	0.646	0.646	0.843	0.825	0.048	0.048	0.067	825.00	39.19	39.19	42.46
(0.40,0.50,0.10)	0.554	0.554	0.745	0.835	0.039	0.039	0.057	835.00	29.87	29.87	33.45
(0.30,0.50,0.20)	0.462	0.462	0.659	0.845	0.029	0.029	0.048	845.00	20.55	20.55	24.75
(0.20,0.50,0.30)	0.356	0.356	0.573	0.855	0.017	0.017	0.039	855.00	12.85	12.85	16.08
(0.10,0.50,0.40)	0.297	0.297	0.483	0.865	0.010	0.010	0.029	865.00	5.72	5.72	7.43
(0.00,0.50,0.50)	0.000	0.000	0.000	0.875	0.000	0.000	0.000	875.00	0.00	0.00	0.00
(0.40,0.60,0.00)	0.649	0.649	0.846	0.830	0.043	0.043	0.062	830.00	34.59	34.59	38.28
(0.30,0.60,0.10)	0.557	0.557	0.760	0.840	0.034	0.034	0.053	840.00	25.27	25.27	29.60
(0.20,0.60,0.20)	0.451	0.451	0.675	0.850	0.021	0.021	0.044	850.00	17.02	17.02	20.90
(0.10,0.60,0.30)	0.392	0.392	0.585	0.860	0.014	0.014	0.034	860.00	9.88	9.88	12.26
(0.00,0.60,0.40)	0.332	0.332	0.503	0.870	0.007	0.007	0.025	870.00	2.74	2.74	3.86
(0.30,0.70,0.00)	0.653	0.653	0.861	0.835	0.039	0.039	0.058	835.00	29.99	29.99	34.43
(0.20,0.70,0.10)	0.546	0.546	0.776	0.845	0.026	0.026	0.049	845.00	21.18	21.18	25.75
(0.10,0.70,020)	0.487	0.487	0.687	0.855	0.018	0.018	0.039	855.00	14.04	14.04	17.05
(0.00,0.70,0.30)	0.427	0.427	0.605	0.865	0.011	0.011	0.030	865.00	6.90	6.90	8.69
(0.20,0.80,0.00)	0.641	0.641	0.877	0.840	0.030	0.030	0.054	840.00	25.34	25.34	30.58
(0.10,0.80,0.10)	0.582	0.582	0.789	0.850	0.023	0.023	0.044	850.00	18.20	18.20	21.85
(0.00,0.80,0.20)	0.522	0.522	0.707	0.860	0.015	0.015	0.035	860.00	11.06	11.06	13.48
(0.10,0.90,0.00)	0.677	0.677	0.891	0.845	0.027	0.027	0.050	845.00	22.36	22.36	26.62
(0.00,0.90,0.10)	0.617	0.617	0.809	0.855	0.020	0.020	0.040	855.00	15.22	15.22	18.27
(0.00,1.00,0.00)	0.712	0.712	0.911	0.850	0.024	0.024	0.046	850.00	19.38	19.38	23.05

Table E.2a: Simulation Results for the Set of Parameters: $n = 1000$, $t = 5, d = 10$, $\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.80, 0.85, 0.90)$

(s_{01}, s_{02}, s_{03})	F			$\overline{R^*}$			$\overline{T^*}$		
	$a_f = 1$	$a_f = 2.5$	$a_f = 5$	$a_f = 1$	$a_f = 2.5$	$a_f = 5$	$a_f = 1$	$a_f = 2.5$	$a_f = 5$
(1.00.0.00,0.00)	3	3	3	2.00	2.00	2.00	0.00	0.00	0.00
(0.90.0.00,0.10)	3	3	3	2.00	2.00	2.00	0.00	0.00	0.00
(0.80.0.00,0.20)	3	3	3	2.00	2.00	1.71	0.00	0.00	1.00
(0.70,0.00,0.30)	3	3	2	2.00	2.00	1.44	0.00	0.00	1.85
(0.60,0.00,0.40)	3	3	2	1.00	1.00	1.35	0.00	0.00	1.79
(0.50,0.00,0.50)	3	3	2	1.00	1.00	1.04	0.00	0.00	2.36
(0.40,0.00,0.60)	3	3	2	1.00	1.00	0.80	0.00	0.00	2.70
(0.30,0.00,0.70)	1	1	2	0.00	0.00	0.65	0.00	0.00	2.50
(0.20,0.00,0.80)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.00,0.90	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.00,1.00)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.90,0.10,0.00)	3	3	3	2.00	2.00	2.00	0.00	0.00	0.00
(0.80,0.10,0.10)	3	3	3	2.00	2.00	1.71	0.00	0.00	1.00
(0.70,0.10,0.20)	3	3	3	2.00	2.00	1.96	0.00	0.00	3.20
(0.60,0.10,0.30)	3	3	2	2.00	2.00	1.39	0.00	0.00	1.82
(0.50,0.10,0.40)	3	3	2	1.00	1.00	1.45	0.00	0.00	3.27
(0.40,0.10,0.50)	3	3	2	1.00	1.00	0.96	0.00	0.00	2.29
(0.30,0.10.0.60)	1	1	2	0.00	0.00	0.69	0.00	0.00	2.58
(0.20,0.10,0.70)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.10,0.80)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.10,0.90)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.80,0.20,0.00)	3	3	3	2.00	2.00	2.17	0.00	0.00	2.79
(0.70,0.20,0.10)	3	3	3	2.00	2.00	1.98	0.00	0.00	3.23
(0.60,0.20,0.20)	3	3	3	2.00	2.00	1.88	0.00	0.00	2.95
(0.50,0.20,0.30)	3	3	3	1.00	1.00	1.84	0.00	0.00	2.88
(0.40,0.20,0.40)	3	3	2	1.00	1.00	1.38	0.00	0.00	3.16
(0.30,0.20,0.50)	3	3	2	1.00	1.00	0.98	0.00	0.00	3.22
(0.20,0.20,0.60)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.20,0.70)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.20,0.80)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.70,0.30,0.00)	3	3	3	2.00	2.00	1.70	0.00	0.00	1.00
(0.60,0.30,0.10)	3	3	3	2.00	2.00	1.95	0.00	0.00	3.18
(0.50,0.30,0.20)	3	3	3	1.00	1.00	1.86	0.00	0.00	2.91

Table E.2a: (continued)

(s_{01}, s_{02}, s_{03})	F			$\overline{R^*}$			$\overline{T^*}$		
	$a_f = 1$	$a_f = 2.5$	$a_f = 5$	$a_f = 1$	$a_f = 2.5$	$a_f = 5$	$a_f = 1$	$a_f = 2.5$	$a_f = 5$
(0.40,0.30,0.30)	3.0	3.0	3.0	1.00	1.00	2.00	0.00	0.00	2.84
(0.30,0.30,0.40)	3.0	3.0	2.0	1.00	1.00	1.00	0.00	0.00	3.05
(0.20,0.30,0.50)	3.0	3.0	2.0	1.00	1.00	1.00	0.00	0.00	1.00
(0.10,0.30,0.60)	1.0	1.0	1.0	0.00	0.00	1.00	0.00	0.00	0.00
(0.00,0.30,0.70)	1.0	1.0	1.0	0.00	0.00	1.00	0.00	0.00	0.00
(0.60,0.40,0.00)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	3.21
(0.50,0.40,0.10)	3.0	3.0	3.0	1.00	1.00	2.00	0.00	0.00	3.13
(0.40,0.40,0.20)	3.0	3.0	3.0	1.00	1.00	2.00	0.00	0.00	2.86
(0.30,0.40,0.30)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.20,0.40,0.40)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.10,0.40,0.50)	1.0	1.0	1.0	0.00	0.00	1.00	0.00	0.00	0.00
(0.00,0.40,0.60)	1.0	1.0	1.0	0.00	0.00	1.00	0.00	0.00	0.00
(0.50,0.50,0.00)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	3.16
(0.40,0.50,0.10)	3.0	3.0	3.0	1.00	1.00	2.00	0.00	0.00	3.08
(0.30,0.50,0.20)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	2.50
(0.20,0.50,0.30)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.10,0.50,0.40)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.00,0.50,0.50)	1.0	1.0	1.0	0.00	0.00	1.00	0.00	0.00	0.00
(0.40,0.60,0.00)	3.0	3.0	3.0	1.00	1.00	2.00	0.00	0.00	3.11
(0.30,0.60,0.10)	3.0	3.0	3.0	1.00	1.00	2.00	0.00	0.00	2.52
(0.20,0.60,0.20)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	2.46
(0.10,0.60,0.30)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.00,0.60,0.40)	1.0	1.0	1.0	0.00	0.00	1.00	0.00	0.00	0.00
(0.30,0.70,0.00)	3.0	3.0	3.0	1.00	1.00	2.00	0.00	0.00	2.54
(0.20,0.70,0.10)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	2.48
(0.10,0.70,020)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.00,0.70,0.30)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.20,0.80,0.00)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	2.50
(0.10,0.80,0.10)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	2.44
(0.00,0.80,0.20)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.10,0.90,0.00)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	2.46
(0.00,0.90,0.10)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.00,1.00,0.00)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	2.42

Table E.2b: Simulation Results for the Set of Parameters: $n = 1000$, $t = 5, d = 10$, $\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.80, 0.85, 0.90)$

(s_{01}, s_{02}, s_{03})	$\overline{s_3^* - s_{03}}$			$r(\underline{s}_0)$	$\overline{r(\underline{s}^*) - r(\underline{s}_0)}$			V_0	$\overline{V^* - V_0}$		
	a_f				a_f				a_f		
	1.0	2.5	5.0		1.0	2.5	5.0		1.0	2.5	5.0
(1.00,0.00,0.00)	0.628	0.628	0.628	0.800	0.628	0.071	0.071	800.00	53.49	53.49	53.49
(0.90,0.00,0.10)	0.536	0.536	0.536	0.810	0.536	0.062	0.062	810.00	44.17	44.17	44.17
(0.80,0.00,0.20)	0.444	0.444	0.441	0.820	0.444	0.052	0.054	820.00	34.84	34.84	35.05
(0.70,0.00,0.30)	0.352	0.352	0.393	0.830	0.352	0.043	0.048	830.00	25.51	25.51	27.38
(0.60,0.00,0.40)	0.119	0.119	0.322	0.840	0.119	0.025	0.040	840.00	16.28	16.28	20.46
(0.50,0.00,0.50)	0.059	0.059	0.280	0.850	0.059	0.018	0.034	850.00	9.13	9.13	14.83
(0.40,0.00,0.60)	0.000	0.000	0.230	0.860	0.000	0.011	0.028	860.00	1.98	1.98	8.99
(0.30,0.00,0.70)	0.000	0.000	0.165	0.870	0.000	0.000	0.020	870.00	0.00	0.00	3.70
(0.20,0.00,0.80)	0.000	0.000	0.000	0.880	0.000	0.000	0.000	880.00	0.00	0.00	0.00
(0.10,0.00,0.90	0.000	0.000	0.000	0.890	0.000	0.000	0.000	890.00	0.00	0.00	0.00
(0.00,0.00,1.00)	0.000	0.000	0.000	0.900	0.000	0.000	0.000	900.00	0.00	0.00	0.00
(0.90,0.10,0.00)	0.631	0.631	0.631	0.805	0.631	0.066	0.066	805.00	48.89	48.89	48.89
(0.80,0.10,0.10)	0.539	0.539	0.537	0.815	0.539	0.057	0.059	815.00	39.56	39.56	39.74
(0.70,0.10,0.20)	0.447	0.447	0.567	0.825	0.447	0.048	0.063	825.00	30.23	30.23	31.06
(0.60,0.10,0.30)	0.356	0.356	0.387	0.835	0.356	0.038	0.043	835.00	20.90	20.90	22.98
(0.50,0.10,0.40)	0.154	0.154	0.389	0.845	0.154	0.022	0.043	845.00	13.29	13.29	16.08
(0.40,0.10,0.50)	0.095	0.095	0.259	0.855	0.095	0.015	0.029	855.00	6.14	6.14	10.27
(0.30,0.10,0.60)	0.000	0.000	0.199	0.865	0.000	0.000	0.022	865.00	0.00	0.00	4.48
(0.20,0.10,0.70)	0.000	0.000	0.000	0.875	0.000	0.000	0.000	875.00	0.00	0.00	0.00
(0.10,0.10,0.80)	0.000	0.000	0.000	0.885	0.000	0.000	0.000	885.00	0.00	0.00	0.00
(0.00,0.10,0.90)	0.000	0.000	0.000	0.895	0.000	0.000	0.000	895.00	0.00	0.00	0.00
(0.80,0.20,0.00)	0.635	0.635	0.759	0.810	0.635	0.062	0.076	810.00	44.28	44.28	44.56
(0.70,0.20,0.10)	0.543	0.543	0.667	0.820	0.543	0.052	0.068	820.00	34.95	34.95	35.81
(0.60,0.20,0.20)	0.451	0.451	0.567	0.830	0.451	0.043	0.057	830.00	25.62	25.62	27.35
(0.50,0.20,0.30)	0.249	0.249	0.484	0.840	0.249	0.026	0.048	840.00	17.46	17.46	18.86
(0.40,0.20,0.40)	0.190	0.190	0.383	0.850	0.190	0.019	0.038	850.00	10.31	10.31	11.91
(0.30,0.20,0.50)	0.131	0.131	0.292	0.860	0.131	0.012	0.029	860.00	3.15	3.15	5.98
(0.20,0.20,0.60)	0.000	0.000	0.000	0.870	0.000	0.000	0.000	870.00	0.00	0.00	0.00
(0.10,0.20,0.70)	0.000	0.000	0.000	0.880	0.000	0.000	0.000	880.00	0.00	0.00	0.00
(0.00,0.20,0.80)	0.000	0.000	0.000	0.890	0.000	0.000	0.000	890.00	0.00	0.00	0.00
(0.70,0.30,0.00)	0.639	0.639	0.646	0.815	0.639	0.057	0.060	815.00	39.68	39.68	40.43
(0.60,0.30,0.10)	0.547	0.547	0.683	0.825	0.547	0.048	0.063	825.00	30.35	30.35	32.09
(0.50,0.30,0.20)	0.344	0.344	0.584	0.835	0.344	0.030	0.053	835.00	21.63	21.63	23.58

Table E.2b: (continued)

(s_{01},s_{02},s_{03})	$\overline{s_3^* - s_{03}}$			$r(\underline{s}_0)$	$\overline{r(\underline{s}^*) - r(\underline{s}_0)}$			V_0	$\overline{V^* - V_0}$		
	a_f				a_f				a_f		
	1.0	2.5	5.0		1.0	2.5	5.0		1.0	2.5	5.0
(0.40,0.30,0.30)	0.285	0.285	0.500	0.845	0.023	0.023	0.044	845.00	14.47	14.47	15.14
(0.30,0.30,0.40)	0.226	0.226	0.378	0.855	0.016	0.016	0.033	855.00	7.32	7.32	7.80
(0.20,0.30,0.50)	0.166	0.166	0.173	0.865	0.009	0.009	0.012	865.00	0.16	0.16	1.50
(0.10,0.30,0.60)	0.000	0.000	0.000	0.875	0.000	0.000	0.000	875.00	0.00	0.00	0.00
(0.00,0.30,0.70)	0.000	0.000	0.000	0.885	0.000	0.000	0.000	885.00	0.00	0.00	0.00
(0.60,0.40,0.00)	0.642	0.642	0.783	0.820	0.053	0.053	0.068	820.00	35.07	35.07	36.82
(0.50,0.40,0.10)	0.439	0.439	0.699	0.830	0.034	0.034	0.059	830.00	25.79	25.79	28.33
(0.40,0.40,0.20)	0.380	0.380	0.600	0.840	0.027	0.027	0.049	840.00	18.64	18.64	19.85
(0.30,0.40,0.30)	0.321	0.321	0.321	0.850	0.020	0.020	0.020	850.00	11.48	11.48	11.48
(0.20,0.40,0.40)	0.261	0.261	0.261	0.860	0.013	0.013	0.013	860.00	4.33	4.33	4.33
(0.10,0.40,0.50)	0.000	0.000	0.000	0.870	0.000	0.000	0.000	870.00	0.00	0.00	0.00
(0.00,0.40,0.60)	0.000	0.000	0.000	0.880	0.000	0.000	0.000	880.00	0.00	0.00	0.00
(0.50,0.50,0.00)	0.646	0.646	0.800	0.825	0.048	0.048	0.064	825.00	30.46	30.46	33.06
(0.40,0.50,0.10)	0.475	0.475	0.715	0.835	0.031	0.031	0.055	835.00	22.80	22.80	24.59
(0.30,0.50,0.20)	0.416	0.416	0.585	0.845	0.024	0.024	0.042	845.00	15.65	15.65	16.19
(0.20,0.50,0.30)	0.356	0.356	0.356	0.855	0.017	0.017	0.017	855.00	8.49	8.49	8.49
(0.10,0.50,0.40)	0.297	0.297	0.297	0.865	0.010	0.010	0.010	865.00	1.34	1.34	1.34
(0.00,0.50,0.50)	0.000	0.000	0.000	0.875	0.000	0.000	0.000	875.00	0.00	0.00	0.00
(0.40,0.60,0.00)	0.570	0.570	0.816	0.830	0.036	0.036	0.060	830.00	26.97	26.97	29.32
(0.30,0.60,0.10)	0.511	0.511	0.685	0.840	0.028	0.028	0.046	840.00	19.81	19.81	20.88
(0.20,0.60,0.20)	0.451	0.451	0.607	0.850	0.021	0.021	0.038	850.00	12.66	12.66	12.73
(0.10,0.60,0.30)	0.392	0.392	0.392	0.860	0.014	0.014	0.014	860.00	5.51	5.51	5.51
(0.00,0.60,0.40)	0.000	0.000	0.000	0.870	0.000	0.000	0.000	870.00	0.00	0.00	0.00
(0.30,0.70,0.00)	0.606	0.606	0.785	0.835	0.033	0.033	0.051	835.00	23.98	23.98	25.55
(0.20,0.70,0.10)	0.546	0.546	0.707	0.845	0.026	0.026	0.043	845.00	16.82	16.82	17.42
(0.10,0.70,020)	0.487	0.487	0.487	0.855	0.018	0.018	0.018	855.00	9.67	9.67	9.67
(0.00,0.70,0.30)	0.427	0.427	0.427	0.865	0.011	0.011	0.011	865.00	2.52	2.52	2.52
(0.20,0.80,0.00)	0.641	0.641	0.807	0.840	0.030	0.030	0.048	840.00	20.99	20.99	22.09
(0.10,0.80,0.10)	0.582	0.582	0.730	0.850	0.023	0.023	0.039	850.00	13.84	13.84	13.95
(0.00,0.80,0.20)	0.522	0.522	0.522	0.860	0.015	0.015	0.015	860.00	6.68	6.68	6.68
(0.10,0.90,0.00)	0.677	0.677	0.829	0.845	0.027	0.027	0.044	845.00	18.00	18.00	18.62
(0.00,0.90,0.10)	0.617	0.617	0.617	0.855	0.020	0.020	0.020	855.00	10.85	10.85	10.85
(0.00,1.00,0.00)	0.712	0.712	0.852	0.850	0.024	0.024	0.040	850.00	15.01	15.01	15.20

Table E.3a: Simulation Results for the Set of Parameters: $n = 1000$, $t = 5, d = 50$, $\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.80,0.85,0.90)$

(s_{01}, s_{02}, s_{03})	F			$\overline{R^*}$			$\overline{T^*}$		
	$a_f = 1$	$a_f = 2.5$	$a_f = 5$	$a_f = 1$	$a_f = 2.5$	$a_f = 5$	$a_f = 1$	$a_f = 2.5$	$a_f = 5$
(1.00.0.00,0.00)	3	3	3	1.00	1.00	1.00	0.00	0.00	0.00
(0.90.0.00,0.10)	3	3	3	1.00	1.00	1.00	0.00	0.00	0.00
(0.80.0.00,0.20)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.70,0.00,0.30)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.60,0.00,0.40)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.50,0.00,0.50)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.40,0.00,0.60)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.30,0.00,0.70)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.20,0.00,0.80)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.00,0.90	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.00,1.00)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.90,0.10,0.00)	3	3	3	1.00	1.00	1.00	0.00	0.00	0.00
(0.80,0.10,0.10)	3	3	3	1.00	1.00	1.00	0.00	0.00	0.00
(0.70,0.10,0.20)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.60,0.10,0.30)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.50,0.10,0.40)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.40,0.10,0.50)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.30,0.10.0.60)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.20,0.10,0.70)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.10,0.80)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.10,0.90)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.80,0.20,0.00)	3	3	3	1.00	1.00	1.00	0.00	0.00	0.00
(0.70,0.20,0.10)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.60,0.20,0.20)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.50,0.20,0.30)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.40,0.20,0.40)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.30,0.20,0.50)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.20,0.20,0.60)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.20,0.70)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.20,0.80)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.70,0.30,0.00)	3	3	3	1.00	1.00	1.00	0.00	0.00	0.00
(0.60,0.30,0.10)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.50,0.30,0.20)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00

Table E.3a: (continued)

(s_{01}, s_{02}, s_{03})	F			$\overline{R^*}$			$\overline{T^*}$		
	$a_f = 1$	$a_f = 2.5$	$a_f = 5$	$a_f = 1$	$a_f = 2.5$	$a_f = 5$	$a_f = 1$	$a_f = 2.5$	$a_f = 5$
(0.40,0.30,0.30)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.30,0.30,0.40)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.20,0.30,0.50)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.30,0.60)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.30,0.70)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.60,0.40,0.00)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.50,0.40,0.10)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.40,0.40,0.20)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.30,0.40,0.30)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.20,0.40,0.40)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.40,0.50)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.40,0.60)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.50,0.50,0.00)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.40,0.50,0.10)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.30,0.50,0.20)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.20,0.50,0.30)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.50,0.40)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.50,0.50)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.40,0.60,0.00)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.30,0.60,0.10)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.20,0.60,0.20)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.60,0.30)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.60,0.40)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.30,0.70,0.00)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.20,0.70,0.10)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.70,020)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.70,0.30)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.20,0.80,0.00)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.80,0.10)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.80,0.20)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.90,0.00)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.90,0.10)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,1.00,0.00)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00

Table E.3b: Simulation Results for the Set of Parameters: $n = 1000$, $t = 5, d = 50$, $\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.80, 0.85, 0.90)$

(s_{01}, s_{02}, s_{03})	$\overline{s_3^* - s_{03}}$			$r(\underline{s}_0)$	$\overline{r(\underline{s}^*) - r(\underline{s}_0)}$			V_0	$\overline{V^* - V_0}$		
	a_f				a_f				a_f		
	1.0	2.5	5.0		1.0	2.5	5.0		1.0	2.5	5.0
(1.00,0.00,0.00)	0.356	0.356	0.356	0.800	0.053	0.053	0.053	800.00	10.76	10.76	10.76
(0.90,0.00,0.10)	0.297	0.297	0.297	0.810	0.046	0.046	0.046	810.00	3.49	3.49	3.49
(0.80,0.00,0.20)	0.000	0.000	0.000	0.820	0.000	0.000	0.000	820.00	0.00	0.00	0.00
(0.70,0.00,0.30)	0.000	0.000	0.000	0.830	0.000	0.000	0.000	830.00	0.00	0.00	0.00
(0.60,0.00,0.40)	0.000	0.000	0.000	0.840	0.000	0.000	0.000	840.00	0.00	0.00	0.00
(0.50,0.00,0.50)	0.000	0.000	0.000	0.850	0.000	0.000	0.000	850.00	0.00	0.00	0.00
(0.40,0.00,0.60)	0.000	0.000	0.000	0.860	0.000	0.000	0.000	860.00	0.00	0.00	0.00
(0.30,0.00,0.70)	0.000	0.000	0.000	0.870	0.000	0.000	0.000	870.00	0.00	0.00	0.00
(0.20,0.00,0.80)	0.000	0.000	0.000	0.880	0.000	0.000	0.000	880.00	0.00	0.00	0.00
(0.10,0.00,0.90)	0.000	0.000	0.000	0.890	0.000	0.000	0.000	890.00	0.00	0.00	0.00
(0.00,0.00,1.00)	0.000	0.000	0.000	0.900	0.000	0.000	0.000	900.00	0.00	0.00	0.00
(0.90,0.10,0.00)	0.392	0.392	0.392	0.805	0.050	0.050	0.050	805.00	7.69	7.69	7.69
(0.80,0.10,0.10)	0.332	0.332	0.332	0.815	0.043	0.043	0.043	815.00	0.42	0.42	0.42
(0.70,0.10,0.20)	0.000	0.000	0.000	0.825	0.000	0.000	0.000	825.00	0.00	0.00	0.00
(0.60,0.10,0.30)	0.000	0.000	0.000	0.835	0.000	0.000	0.000	835.00	0.00	0.00	0.00
(0.50,0.10,0.40)	0.000	0.000	0.000	0.845	0.000	0.000	0.000	845.00	0.00	0.00	0.00
(0.40,0.10,0.50)	0.000	0.000	0.000	0.855	0.000	0.000	0.000	855.00	0.00	0.00	0.00
(0.30,0.10,0.60)	0.000	0.000	0.000	0.865	0.000	0.000	0.000	865.00	0.00	0.00	0.00
(0.20,0.10,0.70)	0.000	0.000	0.000	0.875	0.000	0.000	0.000	875.00	0.00	0.00	0.00
(0.10,0.10,0.80)	0.000	0.000	0.000	0.885	0.000	0.000	0.000	885.00	0.00	0.00	0.00
(0.00,0.10,0.90)	0.000	0.000	0.000	0.895	0.000	0.000	0.000	895.00	0.00	0.00	0.00
(0.80,0.20,0.00)	0.427	0.427	0.427	0.810	0.047	0.047	0.047	810.00	4.62	4.62	4.62
(0.70,0.20,0.10)	0.000	0.000	0.000	0.820	0.000	0.000	0.000	820.00	0.00	0.00	0.00
(0.60,0.20,0.20)	0.000	0.000	0.000	0.830	0.000	0.000	0.000	830.00	0.00	0.00	0.00
(0.50,0.20,0.30)	0.000	0.000	0.000	0.840	0.000	0.000	0.000	840.00	0.00	0.00	0.00
(0.40,0.20,0.40)	0.000	0.000	0.000	0.850	0.000	0.000	0.000	850.00	0.00	0.00	0.00
(0.30,0.20,0.50)	0.000	0.000	0.000	0.860	0.000	0.000	0.000	860.00	0.00	0.00	0.00
(0.20,0.20,0.60)	0.000	0.000	0.000	0.870	0.000	0.000	0.000	870.00	0.00	0.00	0.00
(0.10,0.20,0.70)	0.000	0.000	0.000	0.880	0.000	0.000	0.000	880.00	0.00	0.00	0.00
(0.00,0.20,0.80)	0.000	0.000	0.000	0.890	0.000	0.000	0.000	890.00	0.00	0.00	0.00
(0.70,0.30,0.00)	0.463	0.463	0.463	0.815	0.045	0.045	0.045	815.00	1.55	1.55	1.55
(0.60,0.30,0.10)	0.000	0.000	0.000	0.825	0.000	0.000	0.000	825.00	0.00	0.00	0.00
(0.50,0.30,0.20)	0.000	0.000	0.000	0.835	0.000	0.000	0.000	835.00	0.00	0.00	0.00

Table E.3b: (continued)

(s_{01}, s_{02}, s_{03})	$\overline{s_3^* - s_{03}}$			$r(\underline{s}_0)$	$\overline{r(\underline{s}^*) - r(\underline{s}_0)}$			V_0	$\overline{V^* - V_0}$		
	a_f				a_f				a_f		
	1.0	2.5	5.0		1.0	2.5	5.0		1.0	2.5	5.0
(0.40,0.30,0.30)	0.000	0.000	0.000	0.845	0.000	0.000	0.000	845.00	0.000	0.000	0.000
(0.30,0.30,0.40)	0.000	0.000	0.000	0.855	0.000	0.000	0.000	855.00	0.000	0.000	0.000
(0.20,0.30,0.50)	0.000	0.000	0.000	0.865	0.000	0.000	0.000	865.00	0.000	0.000	0.000
(0.10,0.30,0.60)	0.000	0.000	0.000	0.875	0.000	0.000	0.000	875.00	0.000	0.000	0.000
(0.00,0.30,0.70)	0.000	0.000	0.000	0.885	0.000	0.000	0.000	885.00	0.000	0.000	0.000
(0.60,0.40,0.00)	0.000	0.000	0.000	0.820	0.000	0.000	0.000	820.00	0.000	0.000	0.000
(0.50,0.40,0.10)	0.000	0.000	0.000	0.830	0.000	0.000	0.000	830.00	0.000	0.000	0.000
(0.40,0.40,0.20)	0.000	0.000	0.000	0.840	0.000	0.000	0.000	840.00	0.000	0.000	0.000
(0.30,0.40,0.30)	0.000	0.000	0.000	0.850	0.000	0.000	0.000	850.00	0.000	0.000	0.000
(0.20,0.40,0.40)	0.000	0.000	0.000	0.860	0.000	0.000	0.000	860.00	0.000	0.000	0.000
(0.10,0.40,0.50)	0.000	0.000	0.000	0.870	0.000	0.000	0.000	870.00	0.000	0.000	0.000
(0.00,0.40,0.60)	0.000	0.000	0.000	0.880	0.000	0.000	0.000	880.00	0.000	0.000	0.000
(0.50,0.50,0.00)	0.000	0.000	0.000	0.825	0.000	0.000	0.000	825.00	0.000	0.000	0.000
(0.40,0.50,0.10)	0.000	0.000	0.000	0.835	0.000	0.000	0.000	835.00	0.000	0.000	0.000
(0.30,0.50,0.20)	0.000	0.000	0.000	0.845	0.000	0.000	0.000	845.00	0.000	0.000	0.000
(0.20,0.50,0.30)	0.000	0.000	0.000	0.855	0.000	0.000	0.000	855.00	0.000	0.000	0.000
(0.10,0.50,0.40)	0.000	0.000	0.000	0.865	0.000	0.000	0.000	865.00	0.000	0.000	0.000
(0.00,0.50,0.50)	0.000	0.000	0.000	0.875	0.000	0.000	0.000	875.00	0.000	0.000	0.000
(0.40,0.60,0.00)	0.000	0.000	0.000	0.830	0.000	0.000	0.000	830.00	0.000	0.000	0.000
(0.30,0.60,0.10)	0.000	0.000	0.000	0.840	0.000	0.000	0.000	840.00	0.000	0.000	0.000
(0.20,0.60,0.20)	0.000	0.000	0.000	0.850	0.000	0.000	0.000	850.00	0.000	0.000	0.000
(0.10,0.60,0.30)	0.000	0.000	0.000	0.860	0.000	0.000	0.000	860.00	0.000	0.000	0.000
(0.00,0.60,0.40)	0.000	0.000	0.000	0.870	0.000	0.000	0.000	870.00	0.000	0.000	0.000
(0.30,0.70,0.00)	0.000	0.000	0.000	0.835	0.000	0.000	0.000	835.00	0.000	0.000	0.000
(0.20,0.70,0.10)	0.000	0.000	0.000	0.845	0.000	0.000	0.000	845.00	0.000	0.000	0.000
(0.10,0.70,020)	0.000	0.000	0.000	0.855	0.000	0.000	0.000	855.00	0.000	0.000	0.000
(0.00,0.70,0.30)	0.000	0.000	0.000	0.865	0.000	0.000	0.000	865.00	0.000	0.000	0.000
(0.20,0.80,0.00)	0.000	0.000	0.000	0.840	0.000	0.000	0.000	840.00	0.000	0.000	0.000
(0.10,0.80,0.10)	0.000	0.000	0.000	0.850	0.000	0.000	0.000	850.00	0.000	0.000	0.000
(0.00,0.80,0.20)	0.000	0.000	0.000	0.860	0.000	0.000	0.000	860.00	0.000	0.000	0.000
(0.10,0.90,0.00)	0.000	0.000	0.000	0.845	0.000	0.000	0.000	845.00	0.000	0.000	0.000
(0.00,0.90,0.10)	0.000	0.000	0.000	0.855	0.000	0.000	0.000	855.00	0.000	0.000	0.000
(0.00,1.00,0.00)	0.000	0.000	0.000	0.850	0.000	0.000	0.000	850.00	0.000	0.000	0.000

Table E.4a: Simulation Results for the Set of Parameters: $n = 1000$, $t = 2.5, d = 5$, $\underline{u}_a(g = 0.05, f = 0.25)$, and $\underline{r} = (0.80, 0.85, 0.90)$

(s_{01}, s_{02}, s_{03})	F			$\overline{R^*}$			$\overline{T^*}$		
	$a_f = 1$	$a_f = 2.5$	$a_f = 5$	$a_f = 1$	$a_f = 2.5$	$a_f = 5$	$a_f = 1$	$a_f = 2.5$	$a_f = 5$
(1.00.0.00,0.00)	3	3	3	2.00	2.00	6.67	0.00	0.00	11.73
(0.90.0.00,0.10)	3	3	2	1.00	1.00	6.09	0.00	0.00	12.55
(0.80.0.00,0.20)	1	1	2	0.00	0.00	5.31	0.00	0.00	11.95
(0.70,0.00,0.30)	1	1	2	0.00	0.00	4.67	0.00	0.00	11.47
(0.60,0.00,0.40)	1	1	2	0.00	0.00	4.06	0.00	0.00	10.18
(0.50,0.00,0.50)	1	1	2	0.00	0.00	3.25	0.00	0.00	9.07
(0.40,0.00,0.60)	1	1	2	0.00	0.00	2.58	0.00	0.00	8.02
(0.30,0.00,0.70)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.20,0.00,0.80)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.00,0.90	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.00,1.00)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.90,0.10,0.00)	3	3	3	1.00	1.00	6.64	0.00	0.00	11.68
(0.80,0.10,0.10)	3	3	2	1.00	1.00	5.88	0.00	0.00	12.16
(0.70,0.10,0.20)	1	1	2	0.00	0.00	5.01	0.00	0.00	11.36
(0.60,0.10,0.30)	1	1	2	0.00	0.00	4.26	0.00	0.00	10.63
(0.50,0.10,0.40)	1	1	2	0.00	0.00	3.42	0.00	0.00	9.46
(0.40,0.10,0.50)	1	1	2	0.00	0.00	2.84	0.00	0.00	8.16
(0.30,0.10.0.60)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.20,0.10,0.70)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.10,0.80)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.10,0.90)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.80,0.20,0.00)	3	3	3	1.00	1.00	6.37	0.00	0.00	12.08
(0.70,0.20,0.10)	1	1	2	0.00	0.00	5.22	0.00	0.00	11.80
(0.60,0.20,0.20)	1	1	2	0.00	0.00	4.44	0.00	0.00	11.03
(0.50,0.20,0.30)	1	1	2	0.00	0.00	3.59	0.00	0.00	9.89
(0.40,0.20,0.40)	1	1	2	0.00	0.00	2.83	0.00	0.00	8.72
(0.30,0.20,0.50)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.20,0.20,0.60)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.20,0.70)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.20,0.80)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.70,0.30,0.00)	3	3	3	1.00	1.00	6.33	0.00	0.00	12.00
(0.60,0.30,0.10)	1	1	2	0.00	0.00	4.91	0.00	0.00	11.17
(0.50,0.30,0.20)	1	1	2	0.00	0.00	4.05	0.00	0.00	10.21

Table E.4a: (continued)

(s_{01}, s_{02}, s_{03})	F^*			$\overline{R^*}$			$\overline{T^*}$		
	$a_f=1$	$a_f=2.5$	$a_f=5$	$a_f=1$	$a_f=2.5$	$a_f=5$	$a_f=1$	$a_f=2.5$	$a_f=5$
(0.40,0.30,0.30)	1	1	2	0.00	0.00	3.18	0.00	0.00	8.98
(0.30,0.30,0.40)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.20,0.30,0.50)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.30,0.60)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.30,0.70)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.60,0.40,0.00)	1	1	3	0.00	0.00	6.29	0.00	0.00	11.92
(0.50,0.40,0.10)	1	1	2	0.00	0.00	4.60	0.00	0.00	10.56
(0.40,0.40,0.20)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.30,0.40,0.30)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.20,0.40,0.40)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.40,0.50)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.40,0.60)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.50,0.50,0.00)	1	1	2	0.00	0.00	5.51	0.00	0.00	11.45
(0.40,0.50,0.10)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.30,0.50,0.20)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.20,0.50,0.30)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.50,0.40)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.50,0.50)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.40,0.60,0.00)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.30,0.60,0.10)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.20,0.60,0.20)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.60,0.30)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.60,0.40)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.30,0.70,0.00)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.20,0.70,0.10)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.70,020)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.70,0.30)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.20,0.80,0.00)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.80,0.10)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.80,0.20)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.90,0.00)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.90,0.10)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,1.00,0.00)	1	1	1	0.00	0.00	0.00	0.00	0.00	0.00

Table E.4b: Simulation Results for the Set of Parameters: $n = 1000$, $t = 2.5, d = 5$, $\underline{u}_a(g = 0.05, f = 0.25)$, and $\underline{r} = (0.80, 0.85, 0.90)$

(s_{01}, s_{02}, s_{03})	$\overline{s_3^* - s_{03}}$			$r(\underline{s}_0)$	$\overline{r(\underline{s}^*) - r(\underline{s}_0)}$			V_0	$\overline{V^* - V_0}$		
	a_f				a_f				a_f		
	1.0	2.5	5.0		1.0	2.5	5.0		1.0	2.5	5.0
(1.00.0.00,0.00)	0.153	0.153	0.647	0.800	0.022	0.022	0.082	800.00	14.00	14.00	26.51
(0.90.0.00,0.10)	0.036	0.036	0.560	0.810	0.011	0.011	0.072	810.00	6.58	6.58	17.94
(0.80.0.00,0.20)	0.000	0.000	0.495	0.820	0.000	0.000	0.064	820.00	0.00	0.00	14.26
(0.70,0.00,0.30)	0.000	0.000	0.438	0.830	0.000	0.000	0.056	830.00	0.00	0.00	10.54
(0.60,0.00,0.40)	0.000	0.000	0.370	0.840	0.000	0.000	0.048	840.00	0.00	0.00	7.69
(0.50,0.00,0.50)	0.000	0.000	0.313	0.850	0.000	0.000	0.040	850.00	0.00	0.00	5.70
(0.40,0.00,0.60)	0.000	0.000	0.253	0.860	0.000	0.000	0.032	860.00	0.00	0.00	3.10
(0.30,0.00,0.70)	0.000	0.000	0.000	0.870	0.000	0.000	0.000	870.00	0.00	0.00	0.00
(0.20,0.00,0.80)	0.000	0.000	0.000	0.880	0.000	0.000	0.000	880.00	0.00	0.00	0.00
(0.10,0.00,0.90	0.000	0.000	0.000	0.890	0.000	0.000	0.000	890.00	0.00	0.00	0.00
(0.00,0.00,1.00)	0.000	0.000	0.000	0.900	0.000	0.000	0.000	900.00	0.00	0.00	0.00
(0.90,0.10,0.00)	0.131	0.131	0.650	0.805	0.014	0.014	0.077	805.00	9.56	9.56	21.90
(0.80,0.10,0.10)	0.047	0.047	0.547	0.815	0.007	0.007	0.067	815.00	2.42	2.42	14.07
(0.70,0.10,0.20)	0.000	0.000	0.468	0.825	0.000	0.000	0.058	825.00	0.00	0.00	10.60
(0.60,0.10,0.30)	0.000	0.000	0.402	0.835	0.000	0.000	0.050	835.00	0.00	0.00	7.37
(0.50,0.10,0.40)	0.000	0.000	0.335	0.845	0.000	0.000	0.041	845.00	0.00	0.00	5.24
(0.40,0.10,0.50)	0.000	0.000	0.268	0.855	0.000	0.000	0.033	855.00	0.00	0.00	2.36
(0.30,0.10.0.60)	0.000	0.000	0.000	0.865	0.000	0.000	0.000	865.00	0.00	0.00	0.00
(0.20,0.10,0.70)	0.000	0.000	0.000	0.875	0.000	0.000	0.000	875.00	0.00	0.00	0.00
(0.10,0.10,0.80)	0.000	0.000	0.000	0.885	0.000	0.000	0.000	885.00	0.00	0.00	0.00
(0.00,0.10,0.90)	0.000	0.000	0.000	0.895	0.000	0.000	0.000	895.00	0.00	0.00	0.00
(0.80,0.20,0.00)	0.142	0.142	0.651	0.810	0.009	0.009	0.072	810.00	5.40	5.40	17.15
(0.70,0.20,0.10)	0.000	0.000	0.515	0.820	0.000	0.000	0.060	820.00	0.00	0.00	10.99
(0.60,0.20,0.20)	0.000	0.000	0.433	0.830	0.000	0.000	0.051	830.00	0.00	0.00	7.25
(0.50,0.20,0.30)	0.000	0.000	0.357	0.840	0.000	0.000	0.042	840.00	0.00	0.00	4.60
(0.40,0.20,0.40)	0.000	0.000	0.286	0.850	0.000	0.000	0.034	850.00	0.00	0.00	2.13
(0.30,0.20,0.50)	0.000	0.000	0.000	0.860	0.000	0.000	0.000	860.00	0.00	0.00	0.00
(0.20,0.20,0.60)	0.000	0.000	0.000	0.870	0.000	0.000	0.000	870.00	0.00	0.00	0.00
(0.10,0.20,0.70)	0.000	0.000	0.000	0.880	0.000	0.000	0.000	880.00	0.00	0.00	0.00
(0.00,0.20,0.80)	0.000	0.000	0.000	0.890	0.000	0.000	0.000	890.00	0.00	0.00	0.00
(0.70,0.30,0.00)	0.154	0.154	0.656	0.815	0.005	0.005	0.067	815.00	1.24	1.24	12.72
(0.60,0.30,0.10)	0.000	0.000	0.489	0.825	0.000	0.000	0.054	825.00	0.00	0.00	7.48
(0.50,0.30,0.20)	0.000	0.000	0.397	0.835	0.000	0.000	0.044	835.00	0.00	0.00	4.02

Table E.4b: (continued)

(s_{01},s_{02},s_{03})	$\overline{s_3^* - s_{03}}$			$r(\underline{s}_0)$	$\overline{r(\underline{s}^*) - r(\underline{s}_0)}$			V_0	$\overline{V^* - V_0}$		
	a_f				a_f				a_f		
	1.0	2.5	5.0		1.0	2.5	5.0		1.0	2.5	5.0
(0.40,0.30,0.30)	0.000	0.000	0.314	0.845	0.000	0.000	0.035	845.00	0.000	0.000	1.33
(0.30,0.30,0.40)	0.000	0.000	0.000	0.855	0.000	0.000	0.000	855.00	0.000	0.000	0.00
(0.20,0.30,0.50)	0.000	0.000	0.000	0.865	0.000	0.000	0.000	865.00	0.000	0.000	0.00
(0.10,0.30,0.60)	0.000	0.000	0.000	0.875	0.000	0.000	0.000	875.00	0.000	0.000	0.00
(0.00,0.30,0.70)	0.000	0.000	0.000	0.885	0.000	0.000	0.000	885.00	0.000	0.000	0.00
(0.60,0.40,0.00)	0.000	0.000	0.661	0.820	0.000	0.000	0.062	820.00	0.000	0.000	8.33
(0.50,0.40,0.10)	0.000	0.000	0.463	0.830	0.000	0.000	0.048	830.00	0.000	0.000	3.94
(0.40,0.40,0.20)	0.000	0.000	0.000	0.840	0.000	0.000	0.000	840.00	0.000	0.000	0.00
(0.30,0.40,0.30)	0.000	0.000	0.000	0.850	0.000	0.000	0.000	850.00	0.000	0.000	0.00
(0.20,0.40,0.40)	0.000	0.000	0.000	0.860	0.000	0.000	0.000	860.00	0.000	0.000	0.00
(0.10,0.40,0.50)	0.000	0.000	0.000	0.870	0.000	0.000	0.000	870.00	0.000	0.000	0.00
(0.00,0.40,0.60)	0.000	0.000	0.000	0.880	0.000	0.000	0.000	880.00	0.000	0.000	0.00
(0.50,0.50,0.00)	0.000	0.000	0.579	0.825	0.000	0.000	0.053	825.00	0.000	0.000	3.87
(0.40,0.50,0.10)	0.000	0.000	0.000	0.835	0.000	0.000	0.000	835.00	0.000	0.000	0.00
(0.30,0.50,0.20)	0.000	0.000	0.000	0.845	0.000	0.000	0.000	845.00	0.000	0.000	0.00
(0.20,0.50,0.30)	0.000	0.000	0.000	0.855	0.000	0.000	0.000	855.00	0.000	0.000	0.00
(0.10,0.50,0.40)	0.000	0.000	0.000	0.865	0.000	0.000	0.000	865.00	0.000	0.000	0.00
(0.00,0.50,0.50)	0.000	0.000	0.000	0.875	0.000	0.000	0.000	875.00	0.000	0.000	0.00
(0.40,0.60,0.00)	0.000	0.000	0.000	0.830	0.000	0.000	0.000	830.00	0.000	0.000	0.00
(0.30,0.60,0.10)	0.000	0.000	0.000	0.840	0.000	0.000	0.000	840.00	0.000	0.000	0.00
(0.20,0.60,0.20)	0.000	0.000	0.000	0.850	0.000	0.000	0.000	850.00	0.000	0.000	0.00
(0.10,0.60,0.30)	0.000	0.000	0.000	0.860	0.000	0.000	0.000	860.00	0.000	0.000	0.00
(0.00,0.60,0.40)	0.000	0.000	0.000	0.870	0.000	0.000	0.000	870.00	0.000	0.000	0.00
(0.30,0.70,0.00)	0.000	0.000	0.000	0.835	0.000	0.000	0.000	835.00	0.000	0.000	0.00
(0.20,0.70,0.10)	0.000	0.000	0.000	0.845	0.000	0.000	0.000	845.00	0.000	0.000	0.00
(0.10,0.70,020)	0.000	0.000	0.000	0.855	0.000	0.000	0.000	855.00	0.000	0.000	0.00
(0.00,0.70,0.30)	0.000	0.000	0.000	0.865	0.000	0.000	0.000	865.00	0.000	0.000	0.00
(0.20,0.80,0.00)	0.000	0.000	0.000	0.840	0.000	0.000	0.000	840.00	0.000	0.000	0.00
(0.10,0.80,0.10)	0.000	0.000	0.000	0.850	0.000	0.000	0.000	850.00	0.000	0.000	0.00
(0.00,0.80,0.20)	0.000	0.000	0.000	0.860	0.000	0.000	0.000	860.00	0.000	0.000	0.00
(0.10,0.90,0.00)	0.000	0.000	0.000	0.845	0.000	0.000	0.000	845.00	0.000	0.000	0.00
(0.00,0.90,0.10)	0.000	0.000	0.000	0.855	0.000	0.000	0.000	855.00	0.000	0.000	0.00
(0.00,1.00,0.00)	0.000	0.000	0.000	0.850	0.000	0.000	0.000	850.00	0.000	0.000	0.00

Table E.5a: Simulation Results for the Set of Parameters: $n = 1000$, $t = 2.5, d = 10$, $\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.80,0.85,0.90)$

(s_{01}, s_{02}, s_{03})	F			$\overline{R^*}$			$\overline{T^*}$		
	$a_f=1$	$a_f=2.5$	$a_f=5$	$a_f=1$	$a_f=2.5$	$a_f=5$	$a_f=1$	$a_f=2.5$	$a_f=5$
(1.00.0.00,0.00)	3.0	3.0	3.0	2.00	2.47	2.90	0.00	1.46	3.14
(0.90.0.00,0.10)	3.0	3.0	3.0	2.00	2.47	2.89	0.00	1.46	3.12
(0.80.0.00,0.20)	3.0	3.0	2.0	2.00	2.46	2.56	0.00	1.45	3.74
(0.70,0.00,0.30)	3.0	3.0	2.0	2.00	2.00	2.36	0.00	0.00	3.68
(0.60,0.00,0.40)	3.0	3.0	2.0	2.00	2.00	1.94	0.00	0.00	4.01
(0.50,0.00,0.50)	3.0	3.0	2.0	2.00	2.00	1.57	0.00	0.00	4.05
(0.40,0.00,0.60)	3.0	2.0	2.0	1.00	1.24	1.30	0.00	2.00	3.71
(0.30,0.00,0.70)	1.0	2.0	2.0	0.00	0.48	0.94	0.00	1.48	3.56
(0.20,0.00,0.80)	1.0	1.0	2.0	0.00	0.00	0.63	0.00	0.00	3.22
(0.10,0.00,0.90	1.0	1.0	2.0	0.00	0.00	0.31	0.00	0.00	2.71
(0.00,0.00,1.00)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.90,0.10,0.00)	3.0	3.0	3.0	2.00	2.47	2.89	0.00	1.46	3.13
(0.80,0.10,0.10)	3.0	3.0	3.0	2.00	2.47	2.80	0.00	1.45	3.19
(0.70,0.10,0.20)	3.0	3.0	3.0	2.00	2.00	2.32	0.00	0.00	3.18
(0.60,0.10,0.30)	3.0	3.0	2.0	2.00	2.00	1.92	0.00	0.00	3.64
(0.50,0.10,0.40)	3.0	3.0	2.0	2.00	2.00	1.77	0.00	0.00	3.44
(0.40,0.10,0.50)	3.0	3.0	2.0	2.00	1.48	1.32	0.00	1.47	3.53
(0.30,0.10.0.60)	3.0	3.0	2.0	1.00	1.00	0.95	0.00	0.00	3.47
(0.20,0.10,0.70)	1.0	1.0	2.0	0.00	0.00	0.74	0.00	0.00	3.06
(0.10,0.10,0.80)	1.0	1.0	2.0	0.00	0.00	0.41	0.00	0.00	2.73
(0.00,0.10,0.90)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.80,0.20,0.00)	3.0	3.0	3.0	2.00	2.47	2.88	0.00	1.46	3.11
(0.70,0.20,0.10)	3.0	3.0	3.0	2.00	2.00	2.33	0.00	0.00	3.20
(0.60,0.20,0.20)	3.0	3.0	3.0	2.00	2.00	2.29	0.00	0.00	3.14
(0.50,0.20,0.30)	3.0	3.0	3.0	2.00	2.00	2.26	0.00	0.00	3.08
(0.40,0.20,0.40)	3.0	3.0	2.0	2.00	2.00	1.70	0.00	0.00	3.33
(0.30,0.20,0.50)	3.0	3.0	2.0	1.00	1.47	1.33	0.00	1.46	3.22
(0.20,0.20,0.60)	3.0	2.0	2.0	1.00	0.48	0.87	0.00	1.48	3.09
(0.10,0.20,0.70)	1.0	1.0	2.0	0.00	0.00	0.51	0.00	0.00	2.82
(0.00,0.20,0.80)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.70,0.30,0.00)	3.0	3.0	3.0	2.00	2.47	2.34	0.00	1.45	3.22
(0.60,0.30,0.10)	3.0	3.0	3.0	2.00	2.00	2.31	0.00	0.00	3.16
(0.50,0.30,0.20)	3.0	3.0	3.0	2.00	2.00	2.27	0.00	0.00	3.10

Table E.5a: (continued)

(s_{01}, s_{02}, s_{03})	F			$\overline{R^*}$			$\overline{T^*}$		
	$a_f=1$	$a_f=2.5$	$a_f=5$	$a_f=1$	$a_f=2.5$	$a_f=5$	$a_f=1$	$a_f=2.5$	$a_f=5$
(0.40,0.30,0.30)	3.0	3.0	3.0	2.00	2.00	1.92	0.00	0.00	3.19
(0.30,0.30,0.40)	3.0	3.0	3.0	1.00	1.48	1.88	0.00	1.46	3.10
(0.20,0.30,0.50)	3.0	3.0	2.0	1.00	1.00	1.26	0.00	0.00	3.08
(0.10,0.30,0.60)	1.0	1.0	2.0	0.00	0.00	1.09	0.00	0.00	2.92
(0.00,0.30,0.70)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.60,0.40,0.00)	3.0	3.0	3.0	2.00	2.00	2.32	0.00	0.00	3.18
(0.50,0.40,0.10)	3.0	3.0	3.0	2.00	2.00	2.28	0.00	0.00	3.12
(0.40,0.40,0.20)	3.0	3.0	3.0	2.00	2.00	2.09	0.00	0.00	3.16
(0.30,0.40,0.30)	3.0	3.0	3.0	1.00	1.48	1.89	0.00	1.47	3.13
(0.20,0.40,0.40)	3.0	3.0	3.0	1.00	1.00	1.78	0.00	0.00	3.16
(0.10,0.40,0.50)	3.0	3.0	3.0	1.00	1.00	1.73	0.00	0.00	3.05
(0.00,0.40,0.60)	1.0	1.0	2.0	0.00	0.00	0.95	0.00	0.00	2.87
(0.50,0.50,0.00)	3.0	3.0	3.0	2.00	2.00	2.30	0.00	0.00	3.14
(0.40,0.50,0.10)	3.0	3.0	3.0	2.00	2.00	2.11	0.00	0.00	3.19
(0.30,0.50,0.20)	3.0	3.0	3.0	2.00	1.49	2.06	0.00	1.49	3.10
(0.20,0.50,0.30)	3.0	3.0	3.0	1.00	1.47	1.81	0.00	1.46	3.20
(0.10,0.50,0.40)	3.0	3.0	3.0	1.00	1.00	1.75	0.00	0.00	3.09
(0.00,0.50,0.50)	1.0	1.0	3.0	0.00	0.00	1.59	0.00	0.00	3.13
(0.40,0.60,0.00)	3.0	3.0	3.0	2.00	2.00	2.13	0.00	0.00	3.22
(0.30,0.60,0.10)	3.0	3.0	3.0	2.00	1.49	2.08	0.00	1.49	3.13
(0.20,0.60,0.20)	3.0	3.0	3.0	1.00	1.47	1.83	0.00	1.46	3.24
(0.10,0.60,0.30)	3.0	3.0	3.0	1.00	1.00	1.77	0.00	0.00	3.13
(0.00,0.60,0.40)	3.0	3.0	3.0	1.00	1.00	1.61	0.00	0.00	3.19
(0.30,0.70,0.00)	3.0	3.0	3.0	2.00	2.00	2.10	0.00	0.00	3.16
(0.20,0.70,0.10)	3.0	3.0	3.0	1.00	1.48	1.85	0.00	1.46	3.28
(0.10,0.70,020)	3.0	3.0	3.0	1.00	1.00	1.80	0.00	0.00	3.17
(0.00,0.70,0.30)	3.0	3.0	3.0	1.00	1.00	1.63	0.00	0.00	3.24
(0.20,0.80,0.00)	3.0	3.0	3.0	1.00	1.49	1.88	0.00	1.48	3.33
(0.10,0.80,0.10)	3.0	3.0	3.0	1.00	1.47	1.82	0.00	1.46	3.22
(0.00,0.80,0.20)	3.0	3.0	3.0	1.00	1.00	1.79	0.00	0.00	3.28
(0.10,0.90,0.00)	3.0	3.0	3.0	1.00	1.47	1.84	0.00	1.46	3.26
(0.00,0.90,0.10)	3.0	3.0	3.0	1.00	1.00	1.81	0.00	0.00	3.33
(0.00,1.00,0.00)	3.0	3.0	3.0	1.00	1.00	1.84	0.00	0.00	3.39

Table E.5b: Simulation Results for the Set of Parameters: $n = 1000,\ t = 2.5, d = 5,$ $\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.80,0.85,0.90)$

(s_{01}, s_{02}, s_{03})	$\overline{s_3^* - s_{03}}$			$r(\underline{s}_0)$	$\overline{r(\underline{s}^*) - r(\underline{s}_0)}$			V_0	$\overline{V^* - V_0}$		
	a_f				a_f				a_f		
	1.0	2.5	5.0		1.0	2.5	5.0		1.0	2.5	5.0
(1.00.0.00,0.00)	0.628	0.693	0.846	0.800	0.071	0.077	0.092	800.00	62.20	62.68	72.10
(0.90.0.00,0.10)	0.536	0.598	0.749	0.810	0.062	0.067	0.082	810.00	52.88	53.13	62.34
(0.80.0.00,0.20)	0.444	0.504	0.665	0.820	0.052	0.058	0.073	820.00	43.56	43.58	53.28
(0.70,0.00,0.30)	0.352	0.352	0.572	0.830	0.043	0.043	0.064	830.00	34.24	34.24	44.68
(0.60,0.00,0.40)	0.260	0.260	0.495	0.840	0.034	0.034	0.055	840.00	24.92	24.92	36.86
(0.50,0.00,0.50)	0.168	0.168	0.417	0.850	0.024	0.024	0.046	850.00	15.59	15.59	29.57
(0.40,0.00,0.60)	0.000	0.124	0.330	0.860	0.011	0.017	0.036	860.00	6.33	6.83	22.12
(0.30,0.00,0.70)	0.000	0.039	0.249	0.870	0.000	0.007	0.027	870.00	0.00	1.37	15.01
(0.20,0.00,0.80)	0.000	0.000	0.167	0.880	0.000	0.000	0.018	880.00	0.00	0.00	8.02
(0.10,0.00,0.90	0.000	0.000	0.083	0.890	0.000	0.000	0.009	890.00	0.00	0.00	1.37
(0.00,0.00,1.00)	0.000	0.000	0.000	0.900	0.000	0.000	0.000	900.00	0.00	0.00	0.00
(0.90,0.10,0.00)	0.631	0.695	0.847	0.805	0.066	0.072	0.087	805.00	57.60	57.94	67.21
(0.80,0.10,0.10)	0.539	0.601	0.747	0.815	0.057	0.063	0.077	815.00	48.28	48.39	57.46
(0.70,0.10,0.20)	0.447	0.447	0.617	0.825	0.048	0.048	0.066	825.00	38.96	38.96	48.16
(0.60,0.10,0.30)	0.356	0.356	0.521	0.835	0.038	0.038	0.056	835.00	29.64	29.64	39.16
(0.50,0.10,0.40)	0.264	0.264	0.437	0.845	0.029	0.029	0.047	845.00	20.31	20.31	31.04
(0.40,0.10,0.50)	0.172	0.171	0.351	0.855	0.020	0.021	0.038	855.00	10.99	11.18	23.53
(0.30,0.10.0.60)	0.036	0.036	0.266	0.865	0.008	0.008	0.028	865.00	3.35	3.35	16.05
(0.20,0.10,0.70)	0.000	0.000	0.185	0.875	0.000	0.000	0.019	875.00	0.00	0.00	8.85
(0.10,0.10,0.80)	0.000	0.000	0.101	0.885	0.000	0.000	0.010	885.00	0.00	0.00	1.86
(0.00,0.10,0.90)	0.000	0.000	0.000	0.895	0.000	0.000	0.000	895.00	0.00	0.00	0.00
(0.80,0.20,0.00)	0.635	0.698	0.848	0.810	0.062	0.068	0.082	810.00	53.00	53.19	62.30
(0.70,0.20,0.10)	0.543	0.543	0.716	0.820	0.052	0.052	0.071	820.00	43.68	43.68	53.04
(0.60,0.20,0.20)	0.451	0.451	0.626	0.830	0.043	0.043	0.061	830.00	34.36	34.36	43.83
(0.50,0.20,0.30)	0.359	0.359	0.536	0.840	0.034	0.034	0.052	840.00	25.03	25.03	34.62
(0.40,0.20,0.40)	0.267	0.267	0.424	0.850	0.024	0.024	0.041	850.00	15.71	15.71	25.96
(0.30,0.20,0.50)	0.131	0.195	0.327	0.860	0.012	0.018	0.031	860.00	7.51	7.60	18.01
(0.20,0.20,0.60)	0.071	0.075	0.231	0.870	0.005	0.006	0.022	870.00	0.37	0.72	10.50
(0.10,0.20,0.70)	0.000	0.000	0.139	0.880	0.000	0.000	0.012	880.00	0.00	0.00	3.15
(0.00,0.20,0.80)	0.000	0.000	0.000	0.890	0.000	0.000	0.000	890.00	0.00	0.00	0.00
(0.70,0.30,0.00)	0.639	0.700	0.815	0.815	0.057	0.063	0.076	815.00	48.40	48.45	57.91
(0.60,0.30,0.10)	0.547	0.547	0.725	0.825	0.048	0.048	0.066	825.00	39.08	39.08	48.71
(0.50,0.30,0.20)	0.455	0.455	0.635	0.835	0.038	0.038	0.057	835.00	29.75	29.75	39.48

Table E.5b: (continued)

(s_{01}, s_{02}, s_{03})	$\overline{s_3^* - s_{03}}$			$r(\underline{s}_0)$	$\overline{r(\underline{s}^*) - r(\underline{s}_0)}$			V_0	$\overline{V^* - V_0}$		
	a_f				a_f				a_f		
	1.0	2.5	5.0		1.0	2.5	5.0		1.0	2.5	5.0
(0.40,0.30,0.30)	0.363	0.363	0.529	0.845	0.029	0.029	0.046	845.00	20.43	20.43	30.50
(0.30,0.30,0.40)	0.226	0.291	0.444	0.855	0.016	0.022	0.037	855.00	11.67	12.07	21.64
(0.20,0.30,0.50)	0.166	0.166	0.320	0.865	0.009	0.009	0.026	865.00	4.53	4.53	13.26
(0.10,0.30,0.60)	0.000	0.000	0.242	0.875	0.000	0.000	0.017	875.00	0.00	0.00	5.42
(0.00,0.30,0.70)	0.000	0.000	0.000	0.885	0.000	0.000	0.000	885.00	0.00	0.00	0.00
(0.60,0.40,0.00)	0.642	0.642	0.825	0.820	0.053	0.053	0.071	820.00	43.79	43.79	53.58
(0.50,0.40,0.10)	0.550	0.550	0.735	0.830	0.043	0.043	0.062	830.00	34.47	34.47	44.36
(0.40,0.40,0.20)	0.458	0.458	0.640	0.840	0.034	0.034	0.052	840.00	25.15	25.15	35.35
(0.30,0.40,0.30)	0.321	0.387	0.545	0.850	0.020	0.027	0.042	850.00	15.83	16.55	26.53
(0.20,0.40,0.40)	0.261	0.261	0.461	0.860	0.013	0.013	0.033	860.00	8.69	8.69	17.77
(0.10,0.40,0.50)	0.202	0.202	0.379	0.870	0.006	0.006	0.024	870.00	1.55	1.55	9.13
(0.00,0.40,0.60)	0.000	0.000	0.237	0.880	0.000	0.000	0.012	880.00	0.00	0.00	0.90
(0.50,0.50,0.00)	0.646	0.646	0.834	0.825	0.048	0.048	0.067	825.00	39.19	39.19	49.23
(0.40,0.50,0.10)	0.554	0.554	0.741	0.835	0.039	0.039	0.057	835.00	29.87	29.87	40.26
(0.30,0.50,0.20)	0.462	0.485	0.655	0.845	0.029	0.031	0.048	845.00	20.55	21.02	31.38
(0.20,0.50,0.30)	0.356	0.411	0.563	0.855	0.017	0.023	0.038	855.00	12.85	12.98	22.68
(0.10,0.50,0.40)	0.297	0.297	0.481	0.865	0.010	0.010	0.029	865.00	5.72	5.72	14.04
(0.00,0.50,0.50)	0.000	0.000	0.396	0.875	0.000	0.000	0.020	875.00	0.00	0.00	5.43
(0.40,0.60,0.00)	0.649	0.649	0.842	0.830	0.043	0.043	0.062	830.00	34.59	34.59	45.16
(0.30,0.60,0.10)	0.557	0.581	0.756	0.840	0.034	0.036	0.053	840.00	25.27	25.49	36.29
(0.20,0.60,0.20)	0.451	0.508	0.665	0.850	0.021	0.027	0.043	850.00	17.02	17.45	27.57
(0.10,0.60,0.30)	0.392	0.392	0.582	0.860	0.014	0.014	0.034	860.00	9.88	9.88	18.95
(0.00,0.60,0.40)	0.332	0.332	0.498	0.870	0.007	0.007	0.025	870.00	2.74	2.74	10.34
(0.30,0.70,0.00)	0.653	0.653	0.857	0.835	0.039	0.039	0.058	835.00	29.99	29.99	41.19
(0.20,0.70,0.10)	0.546	0.604	0.766	0.845	0.026	0.032	0.048	845.00	21.18	21.92	32.46
(0.10,0.70,020)	0.487	0.487	0.684	0.855	0.018	0.018	0.039	855.00	14.04	14.04	23.84
(0.00,0.70,0.30)	0.427	0.427	0.601	0.865	0.011	0.011	0.030	865.00	6.90	6.90	15.24
(0.20,0.80,0.00)	0.641	0.701	0.868	0.840	0.030	0.036	0.053	840.00	25.34	26.39	37.34
(0.10,0.80,0.10)	0.582	0.628	0.786	0.850	0.023	0.028	0.044	850.00	18.20	18.35	28.73
(0.00,0.80,0.20)	0.522	0.522	0.714	0.860	0.015	0.015	0.036	860.00	11.06	11.06	20.12
(0.10,0.90,0.00)	0.677	0.724	0.888	0.845	0.027	0.033	0.049	845.00	22.36	22.83	33.61
(0.00,0.90,0.10)	0.617	0.617	0.817	0.855	0.020	0.020	0.041	855.00	15.22	15.22	25.02
(0.00,1.00,0.00)	0.712	0.712	0.920	0.850	0.024	0.024	0.046	850.00	19.38	19.38	29.93

Table E.6a: Simulation Results for the Set of Parameters: $n = 1000$, $t = 2.5, d = 5$, $\underline{u}_c(g = 0.05, f = 1.0)$, and $\underline{r} = (0.80,0.85,0.90)$

(s_{01}, s_{02}, s_{03})	F			$\overline{R^*}$			$\overline{T^*}$		
	$a_f = 1$	$a_f = 2.5$	$a_f = 5$	$a_f = 1$	$a_f = 2.5$	$a_f = 5$	$a_f = 1$	$a_f = 2.5$	$a_f = 5$
(1.00.0.00,0.00)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.90.0.00,0.10)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.80.0.00,0.20)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.70,0.00,0.30)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.60,0.00,0.40)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.50,0.00,0.50)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.40,0.00,0.60)	3.0	3.0	2.0	2.00	2.00	1.08	0.00	0.00	1.69
(0.30,0.00,0.70)	3.0	3.0	2.0	2.00	2.00	0.94	0.00	0.00	1.65
(0.20,0.00,0.80)	3.0	3.0	2.0	2.00	2.00	0.80	0.00	0.00	1.60
(0.10,0.00,0.90	3.0	3.0	2.0	1.00	1.00	0.31	0.00	0.00	2.08
(0.00,0.00,1.00)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.90,0.10,0.00)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.80,0.10,0.10)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.70,0.10,0.20)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.60,0.10,0.30)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.50,0.10,0.40)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.40,0.10,0.50)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.30,0.10.0.60)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.20,0.10,0.70)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.10,0.10,0.80)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.00,0.10,0.90)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.80,0.20,0.00)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.70,0.20,0.10)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.60,0.20,0.20)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.50,0.20,0.30)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.40,0.20,0.40)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.30,0.20,0.50)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.20,0.20,0.60)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.10,0.20,0.70)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.00,0.20,0.80)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.70,0.30,0.00)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.60,0.30,0.10)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.50,0.30,0.20)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00

Table E.6a: (continued)

(s_{01}, s_{02}, s_{03})	F			$\overline{R^*}$			$\overline{T^*}$		
	$a_f=1$	$a_f=2.5$	$a_f=5$	$a_f=1$	$a_f=2.5$	$a_f=5$	$a_f=1$	$a_f=2.5$	$a_f=5$
(0.40,0.30,0.30)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.30,0.30,0.40)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.20,0.30,0.50)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.10,0.30,0.60)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.00,0.30,0.70)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.60,0.40,0.00)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.50,0.40,0.10)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.40,0.40,0.20)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.30,0.40,0.30)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.20,0.40,0.40)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.10,0.40,0.50)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.00,0.40,0.60)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.50,0.50,0.00)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.40,0.50,0.10)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.30,0.50,0.20)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.20,0.50,0.30)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.10,0.50,0.40)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.00,0.50,0.50)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.40,0.60,0.00)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.30,0.60,0.10)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.20,0.60,0.20)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.10,0.60,0.30)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.00,0.60,0.40)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.30,0.70,0.00)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.20,0.70,0.10)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.10,0.70,020)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.00,0.70,0.30)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.20,0.80,0.00)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.10,0.80,0.10)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.00,0.80,0.20)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.10,0.90,0.00)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.00,0.90,0.10)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.00,1.00,0.00)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00

Table E.6b: Simulation Results for the Set of Parameters: $n = 1000$, $t = 2.5, d = 5$, $\underline{u}_c(g = 0.05, f = 1.00)$, and $\underline{r} = (0.80,0.85,0.90)$

(s_{01}, s_{02}, s_{03})	$\overline{s_3^* - s_{03}}$			$r(\underline{s}_0)$	$\overline{r(\underline{s}^*) - r(\underline{s}_0)}$			V_0	$\overline{V^* - V_0}$		
	a_f				a_f				a_f		
	1.0	2.5	5.0		1.0	2.5	5.0		1.0	2.5	5.0
(1.00.0.00,0.00)	0.950	0.950	0.950	0.800	0.097	0.097	0.097	800.00	88.40	88.40	88.40
(0.90.0.00,0.10)	0.855	0.855	0.855	0.810	0.088	0.088	0.088	810.00	78.66	78.66	78.66
(0.80.0.00,0.20)	0.760	0.760	0.760	0.820	0.078	0.078	0.078	820.00	68.92	68.92	68.92
(0.70,0.00,0.30)	0.665	0.665	0.665	0.830	0.068	0.068	0.068	830.00	59.18	59.18	59.18
(0.60,0.00,0.40)	0.570	0.570	0.570	0.840	0.058	0.058	0.058	840.00	49.44	49.44	49.44
(0.50,0.00,0.50)	0.475	0.475	0.475	0.850	0.049	0.049	0.049	850.00	39.70	39.70	39.70
(0.40,0.00,0.60)	0.380	0.380	0.380	0.860	0.039	0.039	0.039	860.00	29.96	29.96	30.16
(0.30,0.00,0.70)	0.285	0.285	0.285	0.870	0.029	0.029	0.029	870.00	20.22	20.22	21.15
(0.20,0.00,0.80)	0.190	0.190	0.190	0.880	0.019	0.019	0.019	880.00	10.48	10.48	12.13
(0.10,0.00,0.90	0.047	0.047	0.095	0.890	0.007	0.007	0.010	890.00	2.64	2.64	3.42
(0.00,0.00,1.00)	0.000	0.000	0.000	0.900	0.000	0.000	0.000	900.00	0.00	0.00	0.00
(0.90,0.10,0.00)	0.955	0.955	0.955	0.805	0.093	0.093	0.093	805.00	83.65	83.65	83.65
(0.80,0.10,0.10)	0.860	0.860	0.860	0.815	0.083	0.083	0.083	815.00	73.91	73.91	73.91
(0.70,0.10,0.20)	0.765	0.765	0.765	0.825	0.073	0.073	0.073	825.00	64.17	64.17	64.17
(0.60,0.10,0.30)	0.670	0.670	0.670	0.835	0.063	0.063	0.063	835.00	54.43	54.43	54.43
(0.50,0.10,0.40)	0.575	0.575	0.575	0.845	0.054	0.054	0.054	845.00	44.69	44.69	44.69
(0.40,0.10,0.50)	0.480	0.480	0.480	0.855	0.044	0.044	0.044	855.00	34.95	34.95	34.95
(0.30,0.10.0.60)	0.385	0.385	0.385	0.865	0.034	0.034	0.034	865.00	25.21	25.21	25.21
(0.20,0.10,0.70)	0.290	0.290	0.290	0.875	0.024	0.024	0.024	875.00	15.47	15.47	15.47
(0.10,0.10,0.80)	0.143	0.143	0.143	0.885	0.012	0.012	0.012	885.00	7.39	7.39	7.39
(0.00,0.10,0.90)	0.095	0.095	0.095	0.895	0.005	0.005	0.005	895.00	0.25	0.25	0.25
(0.80,0.20,0.00)	0.960	0.960	0.960	0.810	0.088	0.088	0.088	810.00	78.90	78.90	78.90
(0.70,0.20,0.10)	0.864	0.864	0.864	0.820	0.078	0.078	0.078	820.00	69.16	69.16	69.16
(0.60,0.20,0.20)	0.769	0.769	0.769	0.830	0.068	0.068	0.068	830.00	59.42	59.42	59.42
(0.50,0.20,0.30)	0.675	0.675	0.675	0.840	0.059	0.059	0.059	840.00	49.68	49.68	49.68
(0.40,0.20,0.40)	0.580	0.580	0.580	0.850	0.049	0.049	0.049	850.00	39.94	39.94	39.94
(0.30,0.20,0.50)	0.484	0.484	0.484	0.860	0.039	0.039	0.039	860.00	30.20	30.20	30.20
(0.20,0.20,0.60)	0.389	0.389	0.389	0.870	0.029	0.029	0.029	870.00	20.46	20.46	20.46
(0.10,0.20,0.70)	0.238	0.238	0.238	0.880	0.017	0.017	0.017	880.00	12.14	12.14	12.14
(0.00,0.20,0.80)	0.190	0.190	0.190	0.890	0.009	0.009	0.009	890.00	5.00	5.00	5.00
(0.70,0.30,0.00)	0.964	0.964	0.964	0.815	0.083	0.083	0.083	815.00	74.14	74.14	74.14
(0.60,0.30,0.10)	0.869	0.869	0.869	0.825	0.073	0.073	0.073	825.00	64.40	64.40	64.40
(0.50,0.30,0.20)	0.774	0.774	0.774	0.835	0.064	0.064	0.064	835.00	54.66	54.66	54.66

Table E.6b: (continued)

(s_{01}, s_{02}, s_{03})	$\overline{s_3^* - s_{03}}$			$r(\underline{s}_0)$	$\overline{r(\underline{s}^*) - r(\underline{s}_0)}$			V_0	$\overline{V^* - V_0}$		
	a_f				a_f				a_f		
	1.0	2.5	5.0		1.0	2.5	5.0		1.0	2.5	5.0
(0.40,0.30,0.30)	0.679	0.679	0.679	0.845	0.054	0.054	0.054	845.00	44.92	44.92	44.92
(0.30,0.30,0.40)	0.584	0.584	0.584	0.855	0.044	0.044	0.044	855.00	35.18	35.18	35.18
(0.20,0.30,0.50)	0.489	0.489	0.489	0.865	0.034	0.034	0.034	865.00	25.44	25.44	25.44
(0.10,0.30,0.60)	0.332	0.332	0.332	0.875	0.021	0.021	0.021	875.00	16.89	16.89	16.89
(0.00,0.30,0.70)	0.285	0.285	0.285	0.885	0.014	0.014	0.014	885.00	9.75	9.75	9.75
(0.60,0.40,0.00)	0.969	0.969	0.969	0.820	0.078	0.078	0.078	820.00	69.39	69.39	69.39
(0.50,0.40,0.10)	0.874	0.874	0.874	0.830	0.069	0.069	0.069	830.00	59.65	59.65	59.65
(0.40,0.40,0.20)	0.779	0.779	0.779	0.840	0.059	0.059	0.059	840.00	49.91	49.91	49.91
(0.30,0.40,0.30)	0.684	0.684	0.684	0.850	0.049	0.049	0.049	850.00	40.17	40.17	40.17
(0.20,0.40,0.40)	0.589	0.589	0.589	0.860	0.039	0.039	0.039	860.00	30.43	30.43	30.43
(0.10,0.40,0.50)	0.428	0.428	0.428	0.870	0.026	0.026	0.026	870.00	21.64	21.64	21.64
(0.00,0.40,0.60)	0.380	0.380	0.380	0.880	0.019	0.019	0.019	880.00	14.51	14.51	14.51
(0.50,0.50,0.00)	0.974	0.974	0.974	0.825	0.074	0.074	0.074	825.00	64.64	64.64	64.64
(0.40,0.50,0.10)	0.879	0.879	0.879	0.835	0.064	0.064	0.064	835.00	54.90	54.90	54.90
(0.30,0.50,0.20)	0.784	0.784	0.784	0.845	0.054	0.054	0.054	845.00	45.16	45.16	45.16
(0.20,0.50,0.30)	0.689	0.689	0.689	0.855	0.044	0.044	0.044	855.00	35.42	35.42	35.42
(0.10,0.50,0.40)	0.523	0.523	0.523	0.865	0.031	0.031	0.031	865.00	26.40	26.40	26.40
(0.00,0.50,0.50)	0.475	0.475	0.475	0.875	0.024	0.024	0.024	875.00	19.26	19.26	19.26
(0.40,0.60,0.00)	0.979	0.979	0.979	0.830	0.069	0.069	0.069	830.00	59.89	59.89	59.89
(0.30,0.60,0.10)	0.883	0.883	0.883	0.840	0.059	0.059	0.059	840.00	50.15	50.15	50.15
(0.20,0.60,0.20)	0.788	0.788	0.788	0.850	0.049	0.049	0.049	850.00	40.41	40.41	40.41
(0.10,0.60,0.30)	0.617	0.617	0.617	0.860	0.036	0.036	0.036	860.00	31.15	31.15	31.15
(0.00,0.60,0.40)	0.570	0.570	0.570	0.870	0.028	0.028	0.028	870.00	24.01	24.01	24.01
(0.30,0.70,0.00)	0.983	0.983	0.983	0.835	0.064	0.064	0.064	835.00	55.13	55.13	55.13
(0.20,0.70,0.10)	0.888	0.888	0.888	0.845	0.054	0.054	0.054	845.00	45.39	45.39	45.39
(0.10,0.70,020)	0.712	0.712	0.712	0.855	0.040	0.040	0.040	855.00	35.90	35.90	35.90
(0.00,0.70,0.30)	0.665	0.665	0.665	0.865	0.033	0.033	0.033	865.00	28.76	28.76	28.76
(0.20,0.80,0.00)	0.988	0.988	0.988	0.840	0.059	0.059	0.059	840.00	50.38	50.38	50.38
(0.10,0.80,0.10)	0.808	0.808	0.808	0.850	0.045	0.045	0.045	850.00	40.65	40.65	40.65
(0.00,0.80,0.20)	0.760	0.760	0.760	0.860	0.038	0.038	0.038	860.00	33.51	33.51	33.51
(0.10,0.90,0.00)	0.993	0.993	0.993	0.845	0.055	0.055	0.055	845.00	45.63	45.63	45.63
(0.00,0.90,0.10)	0.855	0.855	0.855	0.855	0.043	0.043	0.043	855.00	38.26	38.26	38.26
(0.00,1.00,0.00)	0.950	0.950	0.950	0.850	0.047	0.047	0.047	850.00	43.01	43.01	43.01

Table E.7a: Simulation Results for the Set of Parameters: $n = 1000$, $t = 5, d = 5$, $\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.900, 0.945, 0.950)$

(s_{01}, s_{02}, s_{03})	F			$\overline{R^*}$			$\overline{T^*}$		
	$a_f = 1$	$a_f = 7$	$a_f = 10$	$a_f = 1$	$a_f = 7$	$a_f = 10$	$a_f = 1$	$a_f = 7$	$a_f = 10$
(1.00,0.00,0.00)	3.0	3.0	3.0	2.00	2.66	2.64	0.00	1.33	1.64
(0.90,0.00,0.10)	3.0	3.0	3.0	2.00	2.65	2.63	0.00	1.32	1.63
(0.80,0.00,0.20)	3.0	3.0	3.0	2.00	2.64	2.62	0.00	1.32	1.62
(0.70,0.00,0.30)	3.0	3.0	2.0	2.00	2.63	1.89	0.00	1.31	2.17
(0.60,0.00,0.40)	3.0	3.0	2.0	2.00	2.62	1.65	0.00	1.31	2.02
(0.50,0.00,0.50)	3.0	2.0	2.0	2.00	1.37	1.41	0.00	2.31	1.87
(0.40,0.00,0.60)	3.0	2.0	2.0	1.00	1.17	1.18	0.00	2.27	1.73
(0.30,0.00,0.70)	1.0	2.0	2.0	0.00	0.68	0.95	0.00	1.34	1.59
(0.20,0.00,0.80)	1.0	2.0	2.0	0.00	0.52	0.54	0.00	1.26	1.61
(0.10,0.00,0.90)	1.0	1.0	2.0	0.00	0.00	0.28	0.00	0.00	1.37
(0.00,0.00,1.00)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.90,0.10,0.00)	3.0	3.0	3.0	2.00	2.65	2.63	0.00	1.33	1.63
(0.80,0.10,0.10)	3.0	3.0	3.0	2.00	2.64	2.62	0.00	1.32	1.62
(0.70,0.10,0.20)	3.0	3.0	3.0	2.00	2.63	2.61	0.00	1.32	1.61
(0.60,0.10,0.30)	3.0	3.0	2.0	2.00	2.62	1.77	0.00	1.31	2.09
(0.50,0.10,0.40)	3.0	3.0	2.0	2.00	1.73	1.52	0.00	1.37	1.94
(0.40,0.10,0.50)	3.0	2.0	2.0	1.00	1.29	1.30	0.00	2.30	1.80
(0.30,0.10,0.60)	3.0	2.0	2.0	1.00	0.76	1.07	0.00	1.38	1.66
(0.20,0.10,0.70)	1.0	2.0	2.0	0.00	0.60	0.57	0.00	1.30	1.57
(0.10,0.10,0.80)	1.0	1.0	2.0	0.00	0.00	0.40	0.00	0.00	1.40
(0.00,0.10,0.90)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.80,0.20,0.00)	3.0	3.0	3.0	2.00	2.65	2.62	0.00	1.32	1.62
(0.70,0.20,0.10)	3.0	3.0	3.0	2.00	2.63	2.61	0.00	1.32	1.61
(0.60,0.20,0.20)	3.0	3.0	3.0	2.00	2.63	1.75	0.00	1.31	1.75
(0.50,0.20,0.30)	3.0	3.0	3.0	2.00	1.75	1.70	0.00	1.37	1.70
(0.40,0.20,0.40)	3.0	3.0	3.0	2.00	1.70	1.66	0.00	1.35	1.66
(0.30,0.20,0.50)	3.0	3.0	2.0	1.00	1.66	0.81	0.00	1.33	1.81
(0.20,0.20,0.60)	1.0	2.0	2.0	0.00	0.68	0.64	0.00	1.34	1.64
(0.10,0.20,0.70)	1.0	1.0	2.0	0.00	0.00	0.47	0.00	0.00	1.47
(0.00,0.20,0.80)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.70,0.30,0.00)	3.0	3.0	3.0	2.00	2.64	2.62	0.00	1.32	1.62
(0.60,0.30,0.10)	3.0	3.0	3.0	2.00	2.63	1.76	0.00	1.31	1.76
(0.50,0.30,0.20)	3.0	3.0	3.0	2.00	1.76	1.72	0.00	1.38	1.72

Table E.7a : (continued)

(s_{01}, s_{02}, s_{03})	F			$\overline{R^*}$			$\overline{T^*}$		
	$a_f=1$	$a_f=7$	$a_f=10$	$a_f=1$	$a_f=7$	$a_f=10$	$a_f=1$	$a_f=7$	$a_f=10$
(0.40,0.30,0.30)	3.0	3.0	3.0	2.00	1.72	1.67	0.00	1.36	1.67
(0.30,0.30,0.40)	3.0	3.0	3.0	1.00	1.67	1.63	0.00	1.33	1.63
(0.20,0.30,0.50)	3.0	3.0	2.0	1.00	1.62	0.71	0.00	1.31	1.71
(0.10,0.30,0.60)	1.0	2.0	2.0	0.00	0.38	0.54	0.00	1.30	1.54
(0.00,0.30,0.70)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.60,0.40,0.00)	3.0	3.0	3.0	2.00	2.63	1.78	0.00	1.32	1.78
(0.50,0.40,0.10)	3.0	3.0	3.0	2.00	1.78	1.73	0.00	1.39	1.73
(0.40,0.40,0.20)	3.0	3.0	3.0	2.00	1.73	1.69	0.00	1.37	1.69
(0.30,0.40,0.30)	3.0	3.0	3.0	1.00	1.68	1.64	0.00	1.34	1.64
(0.20,0.40,0.40)	3.0	3.0	3.0	1.00	1.63	1.59	0.00	1.32	1.59
(0.10,0.40,0.50)	3.0	3.0	3.0	1.00	1.58	1.55	0.00	1.29	1.55
(0.00,0.40,0.60)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.50,0.50,0.00)	3.0	3.0	3.0	2.00	1.79	1.75	0.00	1.40	1.75
(0.40,0.50,0.10)	3.0	3.0	3.0	2.00	1.75	1.70	0.00	1.37	1.70
(0.30,0.50,0.20)	3.0	3.0	3.0	1.00	1.70	1.66	0.00	1.35	1.66
(0.20,0.50,0.30)	3.0	3.0	3.0	1.00	1.65	1.61	0.00	1.32	1.61
(0.10,0.50,0.40)	3.0	3.0	3.0	1.00	1.60	1.56	0.00	1.30	1.56
(0.00,0.50,0.50)	1.0	1.0	3.0	0.00	0.00	1.52	0.00	0.00	1.52
(0.40,0.60,0.00)	3.0	3.0	3.0	2.00	1.76	1.72	0.00	1.38	1.72
(0.30,0.60,0.10)	3.0	3.0	3.0	2.00	1.71	1.67	0.00	1.36	1.67
(0.20,0.60,0.20)	3.0	3.0	3.0	1.00	1.66	1.62	0.00	1.33	1.62
(0.10,0.60,0.30)	3.0	3.0	3.0	1.00	1.61	1.58	0.00	1.31	1.58
(0.00,0.60,0.40)	3.0	3.0	3.0	1.00	1.56	1.53	0.00	1.28	1.53
(0.30,0.70,0.00)	3.0	3.0	3.0	2.00	1.73	1.69	0.00	1.36	1.69
(0.20,0.70,0.10)	3.0	3.0	3.0	1.00	1.68	1.64	0.00	1.34	1.64
(0.10,0.70,020)	3.0	3.0	3.0	1.00	1.63	1.59	0.00	1.31	1.59
(0.00,0.70,0.30)	3.0	3.0	3.0	1.00	1.58	1.54	0.00	1.29	1.54
(0.20,0.80,0.00)	3.0	3.0	3.0	1.00	1.69	1.66	0.00	1.35	1.66
(0.10,0.80,0.10)	3.0	3.0	3.0	1.00	1.64	1.61	0.00	1.32	1.61
(0.00,0.80,0.20)	3.0	3.0	3.0	1.00	1.59	1.56	0.00	1.30	1.56
(0.10,0.90,0.00)	3.0	3.0	3.0	1.00	1.66	1.62	0.00	1.33	1.62
(0.00,0.90,0.10)	3.0	3.0	3.0	1.00	1.61	1.58	0.00	1.30	1.58
(0.00,1.00,0.00)	3.0	3.0	3.0	1.00	1.62	1.88	0.00	1.31	1.54

Table E.7b: Simulation Results for the Set of Parameters: $n = 1000$, $t = 5, d = 5$, $\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.900, 0.945, 0.950)$

(s_{01}, s_{02}, s_{03})	$\overline{s_3^* - s_{03}}$			$r(\underline{s}_0)$	$\overline{r(\underline{s}^*) - r(\underline{s}_0)}$			V_0	$\overline{V^* - V_0}$		
	a_f				a_f				a_f		
	1.0	7.0	10.0		1.0	7.0	10.0		1.0	7.0	10.0
(1.00,0.00,0.00)	0.628	0.785	0.859	0.900	0.064	0.077	0.084	900.00	54.18	57.18	62.60
(0.90,0.00,0.10)	0.536	0.690	0.762	0.909	0.055	0.068	0.075	909.00	45.79	48.54	53.84
(0.80,0.00,0.20)	0.444	0.594	0.664	0.918	0.047	0.059	0.066	918.00	37.40	39.90	45.07
(0.70,0.00,0.30)	0.352	0.498	0.599	0.927	0.039	0.050	0.058	927.00	29.01	31.25	38.45
(0.60,0.00,0.40)	0.260	0.402	0.512	0.936	0.030	0.042	0.050	936.00	20.62	22.59	31.97
(0.50,0.00,0.50)	0.168	0.346	0.425	0.945	0.022	0.034	0.042	945.00	12.24	16.22	25.47
(0.40,0.00,0.60)	0.000	0.272	0.338	0.954	0.010	0.027	0.033	954.00	4.80	10.24	18.84
(0.30,0.00,0.70)	0.000	0.157	0.250	0.963	0.000	0.016	0.025	963.00	0.00	5.69	12.24
(0.20,0.00,0.80)	0.000	0.100	0.171	0.972	0.000	0.010	0.017	972.00	0.00	1.41	6.10
(0.10,0.00,0.90)	0.000	0.000	0.085	0.981	0.000	0.000	0.008	981.00	0.00	0.00	0.18
(0.00,0.00,1.00)	0.000	0.000	0.000	0.990	0.000	0.000	0.000	990.00	0.00	0.00	0.00
(0.90,0.10,0.00)	0.631	0.787	0.860	0.905	0.060	0.072	0.079	904.50	50.04	52.86	58.21
(0.80,0.10,0.10)	0.539	0.691	0.762	0.914	0.051	0.064	0.070	913.50	41.65	44.23	49.46
(0.70,0.10,0.20)	0.447	0.595	0.665	0.923	0.043	0.055	0.061	922.50	33.26	35.57	40.67
(0.60,0.10,0.30)	0.356	0.499	0.560	0.932	0.035	0.046	0.052	931.50	24.87	26.92	33.20
(0.50,0.10,0.40)	0.264	0.337	0.473	0.941	0.026	0.034	0.044	940.50	16.48	18.73	26.76
(0.40,0.10,0.50)	0.095	0.324	0.386	0.950	0.013	0.029	0.035	949.50	8.54	11.73	20.15
(0.30,0.10,0.60)	0.036	0.188	0.299	0.959	0.007	0.017	0.027	958.50	2.11	6.46	13.54
(0.20,0.10,0.70)	0.000	0.132	0.192	0.968	0.000	0.011	0.018	967.50	0.00	2.18	7.12
(0.10,0.10,0.80)	0.000	0.000	0.117	0.977	0.000	0.000	0.010	976.50	0.00	0.00	0.92
(0.00,0.10,0.90)	0.000	0.000	0.000	0.986	0.000	0.000	0.000	985.50	0.00	0.00	0.00
(0.80,0.20,0.00)	0.635	0.788	0.860	0.909	0.056	0.068	0.075	909.00	45.90	48.54	53.82
(0.70,0.20,0.10)	0.543	0.692	0.763	0.918	0.047	0.059	0.066	918.00	37.51	39.90	45.05
(0.60,0.20,0.20)	0.451	0.596	0.609	0.927	0.039	0.050	0.054	927.00	29.12	31.24	37.24
(0.50,0.20,0.30)	0.359	0.436	0.525	0.936	0.030	0.038	0.046	936.00	20.73	22.92	29.41
(0.40,0.20,0.40)	0.267	0.360	0.440	0.945	0.022	0.030	0.038	945.00	12.34	15.58	21.53
(0.30,0.20,0.50)	0.131	0.283	0.319	0.954	0.011	0.023	0.028	954.00	5.86	8.25	14.97
(0.20,0.20,0.60)	0.000	0.164	0.243	0.963	0.000	0.013	0.020	963.00	0.00	2.96	8.71
(0.10,0.20,0.70)	0.000	0.000	0.167	0.972	0.000	0.000	0.012	972.00	0.00	0.00	2.49
(0.00,0.20,0.80)	0.000	0.000	0.000	0.981	0.000	0.000	0.000	981.00	0.00	0.00	0.00
(0.70,0.30,0.00)	0.639	0.789	0.861	0.913	0.051	0.064	0.070	913.50	41.76	44.22	49.41
(0.60,0.30,0.10)	0.547	0.694	0.709	0.923	0.043	0.055	0.059	922.50	33.37	35.57	41.60
(0.50,0.30,0.20)	0.455	0.536	0.625	0.931	0.035	0.042	0.051	931.50	24.98	27.11	33.78

Table E.7b: (continued)

(s_{01}, s_{02}, s_{03})	$\overline{s_3^* - s_{03}}$			$r(\underline{s}_0)$	$\overline{r(\underline{s}^*) - r(\underline{s}_0)}$			V_0	$\overline{V^* - V_0}$		
	a_f				a_f				a_f		
	1.0	7.0	10.0		1.0	7.0	10.0		1.0	7.0	10.0
(0.40,0.30,0.30)	0.363	0.459	0.541	0.941	0.026	0.035	0.042	940.50	16.59	19.77	25.91
(0.30,0.30,0.40)	0.226	0.383	0.457	0.950	0.014	0.027	0.034	949.50	9.61	12.45	18.06
(0.20,0.30,0.50)	0.166	0.306	0.294	0.959	0.008	0.019	0.022	958.50	3.18	5.14	10.32
(0.10,0.30,0.60)	0.000	0.135	0.218	0.968	0.000	0.008	0.014	967.50	0.00	0.11	4.07
(0.00,0.30,0.70)	0.000	0.000	0.000	0.976	0.000	0.000	0.000	976.50	0.00	0.00	0.00
(0.60,0.40,0.00)	0.642	0.791	0.810	0.918	0.047	0.059	0.063	918.00	37.62	39.88	45.96
(0.50,0.40,0.10)	0.550	0.635	0.725	0.927	0.039	0.047	0.055	927.00	29.23	31.30	38.14
(0.40,0.40,0.20)	0.458	0.559	0.641	0.936	0.031	0.039	0.047	936.00	20.84	23.96	30.28
(0.30,0.40,0.30)	0.321	0.482	0.557	0.945	0.018	0.031	0.039	945.00	13.35	16.64	22.44
(0.20,0.40,0.40)	0.261	0.406	0.473	0.954	0.012	0.024	0.030	954.00	6.92	9.34	14.61
(0.10,0.40,0.50)	0.202	0.329	0.389	0.963	0.005	0.016	0.022	963.00	0.50	2.04	6.77
(0.00,0.40,0.60)	0.000	0.000	0.000	0.972	0.000	0.000	0.000	972.00	0.00	0.00	0.00
(0.50,0.50,0.00)	0.646	0.735	0.826	0.922	0.043	0.051	0.060	922.50	33.47	35.48	42.50
(0.40,0.50,0.10)	0.554	0.658	0.742	0.931	0.035	0.043	0.051	931.50	25.08	28.15	34.63
(0.30,0.50,0.20)	0.416	0.582	0.657	0.940	0.022	0.036	0.043	940.50	17.10	20.83	26.81
(0.20,0.50,0.30)	0.356	0.505	0.573	0.950	0.015	0.028	0.035	949.50	10.67	13.53	18.99
(0.10,0.50,0.40)	0.297	0.429	0.489	0.959	0.009	0.020	0.027	958.50	4.24	6.24	11.16
(0.00,0.50,0.50)	0.000	0.000	0.405	0.968	0.000	0.000	0.018	967.50	0.00	0.00	3.31
(0.40,0.60,0.00)	0.649	0.758	0.842	0.927	0.039	0.048	0.056	927.00	29.33	32.33	38.99
(0.30,0.60,0.10)	0.557	0.681	0.758	0.936	0.031	0.040	0.048	936.00	20.94	25.02	31.16
(0.20,0.60,0.20)	0.451	0.605	0.674	0.945	0.019	0.032	0.039	945.00	14.41	17.72	23.36
(0.10,0.60,0.30)	0.392	0.528	0.590	0.954	0.013	0.025	0.031	954.00	7.99	10.43	15.54
(0.00,0.60,0.40)	0.332	0.452	0.506	0.963	0.006	0.017	0.023	963.00	1.56	3.12	7.69
(0.30,0.70,0.00)	0.653	0.781	0.858	0.931	0.035	0.044	0.052	931.50	25.19	29.20	35.52
(0.20,0.70,0.10)	0.546	0.704	0.774	0.941	0.023	0.037	0.044	940.50	18.16	21.91	27.71
(0.10,0.70,020)	0.487	0.628	0.690	0.950	0.017	0.029	0.036	949.50	11.73	14.62	19.91
(0.00,0.70,0.30)	0.427	0.551	0.606	0.959	0.010	0.021	0.027	958.50	5.31	7.31	12.08
(0.20,0.80,0.00)	0.641	0.804	0.874	0.936	0.027	0.041	0.048	936.00	21.90	26.09	32.07
(0.10,0.80,0.10)	0.582	0.727	0.790	0.945	0.020	0.033	0.040	945.00	15.48	18.81	24.26
(0.00,0.80,0.20)	0.522	0.651	0.707	0.954	0.014	0.026	0.032	954.00	9.05	11.50	16.44
(0.10,0.90,0.00)	0.677	0.827	0.891	0.941	0.024	0.038	0.045	940.50	19.22	22.98	28.62
(0.00,0.90,0.10)	0.617	0.750	0.807	0.950	0.018	0.030	0.036	949.50	12.80	15.69	20.80
(0.00,1.00,0.00)	0.712	0.850	0.932	0.945	0.021	0.034	0.042	945.00	16.54	19.86	25.09

Table E.8a: Simulation Results for the Set of Parameters: $n = 1000$, $t = 5, d = 10$, $\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.900, 0.945, 0.950)$

(s_{01}, s_{02}, s_{03})	F			$\overline{R^*}$			$\overline{T^*}$		
	$a_f = 1$	$a_f = 7$	$a_f = 10$	$a_f = 1$	$a_f = 7$	$a_f = 10$	$a_f = 1$	$a_f = 7$	$a_f = 10$
(1.00,0.00,0.00)	3.0	3.0	3.0	2.00	2.36	1.91	0.00	1.36	1.91
(0.90,0.00,0.10)	3.0	3.0	3.0	2.00	2.35	1.86	0.00	1.35	1.86
(0.80,0.00,0.20)	3.0	3.0	3.0	2.00	1.47	1.81	0.00	1.47	1.81
(0.70,0.00,0.30)	3.0	3.0	2.0	2.00	1.44	1.37	0.00	1.44	2.37
(0.60,0.00,0.40)	3.0	2.0	2.0	1.00	1.26	1.19	0.00	2.39	2.19
(0.50,0.00,0.50)	3.0	2.0	2.0	1.00	1.09	1.01	0.00	2.34	2.01
(0.40,0.00,0.60)	1.0	2.0	2.0	0.00	0.75	0.84	0.00	1.43	1.84
(0.30,0.00,0.70)	1.0	2.0	2.0	0.00	0.37	0.67	0.00	1.37	1.67
(0.20,0.00,0.80)	1.0	1.0	2.0	0.00	0.00	0.39	0.00	0.00	1.67
(0.10,0.00,0.90)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.00,1.00)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.90,0.10,0.00)	3.0	3.0	3.0	2.00	2.35	1.88	0.00	1.35	1.88
(0.80,0.10,0.10)	3.0	3.0	3.0	2.00	1.48	1.83	0.00	1.48	1.83
(0.70,0.10,0.20)	3.0	3.0	3.0	2.00	1.45	1.78	0.00	1.45	1.78
(0.60,0.10,0.30)	3.0	3.0	2.0	1.00	1.42	1.27	0.00	1.42	2.27
(0.50,0.10,0.40)	3.0	3.0	2.0	1.00	1.40	1.08	0.00	1.40	2.08
(0.40,0.10,0.50)	3.0	2.0	2.0	1.00	0.51	0.91	0.00	1.51	1.91
(0.30,0.10,0.60)	1.0	2.0	2.0	0.00	0.42	0.74	0.00	1.42	1.74
(0.20,0.10,0.70)	1.0	2.0	2.0	0.00	0.32	0.57	0.00	1.32	1.57
(0.10,0.10,0.80)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.10,0.90)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.80,0.20,0.00)	3.0	3.0	3.0	2.00	1.49	1.85	0.00	1.49	1.85
(0.70,0.20,0.10)	3.0	3.0	3.0	2.00	1.46	1.80	0.00	1.46	1.80
(0.60,0.20,0.20)	3.0	3.0	3.0	1.00	1.43	1.75	0.00	1.43	1.75
(0.50,0.20,0.30)	3.0	3.0	2.0	1.00	1.41	1.16	0.00	1.41	2.16
(0.40,0.20,0.40)	3.0	3.0	2.0	1.00	1.38	0.98	0.00	1.38	1.98
(0.30,0.20,0.50)	3.0	2.0	2.0	1.00	0.46	0.81	0.00	1.46	1.81
(0.20,0.20,0.60)	1.0	2.0	2.0	0.00	0.36	0.64	0.00	1.36	1.64
(0.10,0.20,0.70)	1.0	1.0	2.0	0.00	0.00	0.47	0.00	0.00	1.47
(0.00,0.20,0.80)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.70,0.30,0.00)	3.0	3.0	3.0	2.00	1.47	1.81	0.00	1.47	1.81
(0.60,0.30,0.10)	3.0	3.0	3.0	1.00	1.44	1.76	0.00	1.44	1.76
(0.50,0.30,0.20)	3.0	3.0	3.0	1.00	1.41	1.72	0.00	1.41	1.72

Table E.8a : (continued)

(s_{01}, s_{02}, s_{03})	F			$\overline{R^*}$			$\overline{T^*}$		
	$a_f=1$	$a_f=7$	$a_f=10$	$a_f=1$	$a_f=7$	$a_f=10$	$a_f=1$	$a_f=7$	$a_f=10$
(0.40,0.30,0.30)	3.0	3.0	3.0	1.00	1.39	1.67	0.00	1.39	1.67
(0.30,0.30,0.40)	3.0	3.0	2.0	1.00	1.36	0.88	0.00	1.36	1.88
(0.20,0.30,0.50)	1.0	2.0	2.0	0.00	0.40	0.71	0.00	1.40	1.71
(0.10,0.30,0.60)	1.0	1.0	2.0	0.00	0.00	0.54	0.00	0.00	1.54
(0.00,0.30,0.70)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.60,0.40,0.00)	3.0	3.0	3.0	2.00	1.45	1.78	0.00	1.45	1.78
(0.50,0.40,0.10)	3.0	3.0	3.0	1.00	1.42	1.73	0.00	1.42	1.73
(0.40,0.40,0.20)	3.0	3.0	3.0	1.00	1.40	1.69	0.00	1.40	1.69
(0.30,0.40,0.30)	3.0	3.0	3.0	1.00	1.37	1.64	0.00	1.37	1.64
(0.20,0.40,0.40)	3.0	3.0	2.0	1.00	1.34	0.78	0.00	1.34	1.78
(0.10,0.40,0.50)	1.0	1.0	2.0	0.00	0.00	0.61	0.00	0.00	1.61
(0.00,0.40,0.60)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.50,0.50,0.00)	3.0	3.0	3.0	1.00	1.43	1.75	0.00	1.43	1.75
(0.40,0.50,0.10)	3.0	3.0	3.0	1.00	1.41	1.70	0.00	1.41	1.70
(0.30,0.50,0.20)	3.0	3.0	3.0	1.00	1.38	1.66	0.00	1.38	1.66
(0.20,0.50,0.30)	3.0	3.0	3.0	1.00	1.35	1.61	0.00	1.35	1.61
(0.10,0.50,0.40)	1.0	1.0	2.0	0.00	0.00	0.68	0.00	0.00	1.68
(0.00,0.50,0.50)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.40,0.60,0.00)	3.0	3.0	3.0	1.00	1.42	1.72	0.00	1.42	1.72
(0.30,0.60,0.10)	3.0	3.0	3.0	1.00	1.39	1.67	0.00	1.39	1.67
(0.20,0.60,0.20)	3.0	3.0	3.0	1.00	1.36	1.62	0.00	1.36	1.62
(0.10,0.60,0.30)	3.0	3.0	3.0	1.00	1.33	1.58	0.00	1.33	1.58
(0.00,0.60,0.40)	1.0	1.0	3.0	0.00	0.00	1.53	0.00	0.00	1.53
(0.30,0.70,0.00)	3.0	3.0	3.0	1.00	1.40	1.69	0.00	1.40	1.69
(0.20,0.70,0.10)	3.0	3.0	3.0	1.00	1.37	1.64	0.00	1.37	1.64
(0.10,0.70,020)	3.0	3.0	3.0	1.00	1.34	1.59	0.00	1.34	1.59
(0.00,0.70,0.30)	3.0	3.0	3.0	1.00	1.32	1.54	0.00	1.32	1.54
(0.20,0.80,0.00)	3.0	3.0	3.0	1.00	1.38	1.66	0.00	1.38	1.66
(0.10,0.80,0.10)	3.0	3.0	3.0	1.00	1.35	1.61	0.00	1.35	1.61
(0.00,0.80,0.20)	3.0	3.0	3.0	1.00	1.32	1.56	0.00	1.32	1.56
(0.10,0.90,0.00)	3.0	3.0	3.0	1.00	1.36	1.62	0.00	1.36	1.62
(0.00,0.90,0.10)	3.0	3.0	3.0	1.00	1.33	1.58	0.00	1.33	1.58
(0.00,1.00,0.00)	3.0	3.0	3.0	1.00	1.34	1.59	0.00	1.34	1.59

Table E.8b: Simulation Results for the Set of Parameters: $n = 1000$, $t = 5, d = 10$, $\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.900, 0.945, 0.950)$

(s_{01}, s_{02}, s_{03})	$\overline{s_3^* - s_{03}}$			$r(\underline{s}_0)$	$\overline{r(\underline{s}^*) - r(\underline{s}_0)}$			V_0	$\overline{V^* - V_0}$		
	a_f				a_f				a_f		
	1.0	7.0	10.0		1.0	7.0	10.0		1.0	7.0	10.0
(1.00,0.00,0.00)	0.628	0.757	0.745	0.900	0.064	0.075	0.079	900.00	44.54	45.45	50.43
(0.90,0.00,0.10)	0.536	0.662	0.661	0.909	0.055	0.066	0.070	909.00	36.15	36.86	42.86
(0.80,0.00,0.20)	0.444	0.433	0.576	0.918	0.047	0.050	0.062	918.00	27.75	29.10	35.26
(0.70,0.00,0.30)	0.352	0.359	0.520	0.927	0.039	0.043	0.055	927.00	19.36	21.95	29.87
(0.60,0.00,0.40)	0.119	0.382	0.445	0.936	0.022	0.039	0.047	936.00	12.86	15.25	24.60
(0.50,0.00,0.50)	0.059	0.315	0.370	0.945	0.016	0.032	0.039	945.00	6.42	10.41	19.32
(0.40,0.00,0.60)	0.000	0.204	0.293	0.954	0.000	0.021	0.031	954.00	0.00	6.25	13.89
(0.30,0.00,0.70)	0.000	0.115	0.217	0.963	0.000	0.013	0.023	963.00	0.00	2.98	8.50
(0.20,0.00,0.80)	0.000	0.000	0.149	0.972	0.000	0.000	0.016	972.00	0.00	0.00	3.64
(0.10,0.00,0.90)	0.000	0.000	0.000	0.981	0.000	0.000	0.000	981.00	0.00	0.00	0.00
(0.00,0.00,1.00)	0.000	0.000	0.000	0.990	0.000	0.000	0.000	990.00	0.00	0.00	0.00
(0.90,0.10,0.00)	0.631	0.759	0.761	0.905	0.060	0.071	0.075	904.50	40.40	41.16	47.15
(0.80,0.10,0.10)	0.539	0.531	0.677	0.914	0.051	0.055	0.066	913.50	32.00	33.18	39.54
(0.70,0.10,0.20)	0.447	0.456	0.593	0.923	0.043	0.047	0.058	922.50	23.61	26.04	31.96
(0.60,0.10,0.30)	0.214	0.382	0.495	0.932	0.026	0.040	0.049	931.50	16.60	18.89	25.71
(0.50,0.10,0.40)	0.154	0.308	0.420	0.941	0.020	0.032	0.041	940.50	10.17	11.74	20.52
(0.40,0.10,0.50)	0.095	0.189	0.344	0.950	0.013	0.019	0.033	949.50	3.73	7.00	15.16
(0.30,0.10,0.60)	0.000	0.147	0.268	0.959	0.000	0.015	0.026	958.50	0.00	3.69	9.73
(0.20,0.10,0.70)	0.000	0.105	0.192	0.968	0.000	0.010	0.018	967.50	0.00	0.36	4.32
(0.10,0.10,0.80)	0.000	0.000	0.000	0.977	0.000	0.000	0.000	976.50	0.00	0.00	0.00
(0.00,0.10,0.90)	0.000	0.000	0.000	0.986	0.000	0.000	0.000	985.50	0.00	0.00	0.00
(0.80,0.20,0.00)	0.635	0.629	0.777	0.909	0.056	0.059	0.071	909.00	36.25	37.26	43.83
(0.70,0.20,0.10)	0.543	0.554	0.693	0.918	0.047	0.051	0.063	918.00	27.86	30.13	36.24
(0.60,0.20,0.20)	0.309	0.480	0.609	0.927	0.030	0.044	0.054	927.00	20.35	22.98	28.66
(0.50,0.20,0.30)	0.249	0.406	0.469	0.936	0.024	0.036	0.044	936.00	13.91	15.83	21.63
(0.40,0.20,0.40)	0.190	0.332	0.394	0.945	0.017	0.029	0.036	945.00	7.48	8.64	16.36
(0.30,0.20,0.50)	0.131	0.179	0.319	0.954	0.011	0.016	0.028	954.00	1.04	4.41	10.99
(0.20,0.20,0.60)	0.000	0.138	0.243	0.963	0.000	0.011	0.020	963.00	0.00	1.08	5.55
(0.10,0.20,0.70)	0.000	0.000	0.167	0.972	0.000	0.000	0.012	972.00	0.00	0.00	0.18
(0.00,0.20,0.80)	0.000	0.000	0.000	0.981	0.000	0.000	0.000	981.00	0.00	0.00	0.00
(0.70,0.30,0.00)	0.639	0.652	0.793	0.913	0.051	0.056	0.067	913.50	32.11	34.20	40.53
(0.60,0.30,0.10)	0.404	0.578	0.709	0.923	0.034	0.048	0.059	922.50	24.10	27.07	32.94
(0.50,0.30,0.20)	0.344	0.504	0.625	0.931	0.027	0.041	0.051	931.50	17.66	19.92	25.35

Table E.8b : (continued)

(s_{01}, s_{02}, s_{03})	$\overline{s_3^* - s_{03}}$			$r(\underline{s}_0)$	$\overline{r(\underline{s}^*) - r(\underline{s}_0)}$			V_0	$\overline{V^* - V_0}$		
	a_f				a_f				a_f		
	1.0	7.0	10.0		1.0	7.0	10.0		1.0	7.0	10.0
(0.40,0.30,0.30)	0.285	0.429	0.541	0.941	0.021	0.033	0.042	940.50	11.22	12.73	17.70
(0.30,0.30,0.40)	0.226	0.355	0.369	0.950	0.014	0.025	0.030	949.50	4.79	5.56	12.19
(0.20,0.30,0.50)	0.000	0.170	0.294	0.959	0.000	0.013	0.022	958.50	0.00	1.81	6.83
(0.10,0.30,0.60)	0.000	0.000	0.218	0.968	0.000	0.000	0.014	967.50	0.00	0.00	1.40
(0.00,0.30,0.70)	0.000	0.000	0.000	0.976	0.000	0.000	0.000	976.50	0.00	0.00	0.00
(0.60,0.40,0.00)	0.642	0.675	0.810	0.918	0.047	0.052	0.063	918.00	27.96	31.14	37.23
(0.50,0.40,0.10)	0.439	0.601	0.725	0.927	0.031	0.045	0.055	927.00	21.41	24.00	29.63
(0.40,0.40,0.20)	0.380	0.527	0.641	0.936	0.025	0.037	0.047	936.00	14.97	16.82	21.99
(0.30,0.40,0.30)	0.321	0.453	0.557	0.945	0.018	0.030	0.039	945.00	8.53	9.65	14.38
(0.20,0.40,0.40)	0.261	0.379	0.344	0.954	0.012	0.022	0.024	954.00	2.10	2.53	8.02
(0.10,0.40,0.50)	0.000	0.000	0.269	0.963	0.000	0.000	0.017	963.00	0.00	0.00	2.67
(0.00,0.40,0.60)	0.000	0.000	0.000	0.972	0.000	0.000	0.000	972.00	0.00	0.00	0.00
(0.50,0.50,0.00)	0.534	0.699	0.826	0.922	0.035	0.049	0.060	922.50	25.16	28.07	33.91
(0.40,0.50,0.10)	0.475	0.625	0.742	0.931	0.028	0.041	0.051	931.50	18.72	20.90	26.26
(0.30,0.50,0.20)	0.416	0.550	0.657	0.940	0.022	0.034	0.043	940.50	12.28	13.74	18.67
(0.20,0.50,0.30)	0.356	0.476	0.573	0.950	0.015	0.026	0.035	949.50	5.84	6.62	11.09
(0.10,0.50,0.40)	0.000	0.000	0.319	0.959	0.000	0.000	0.019	958.50	0.00	0.00	3.86
(0.00,0.50,0.50)	0.000	0.000	0.000	0.968	0.000	0.000	0.000	967.50	0.00	0.00	0.00
(0.40,0.60,0.00)	0.570	0.722	0.842	0.927	0.032	0.046	0.056	927.00	22.47	24.97	30.55
(0.30,0.60,0.10)	0.511	0.648	0.758	0.936	0.026	0.038	0.048	936.00	16.03	17.82	22.94
(0.20,0.60,0.20)	0.451	0.574	0.674	0.945	0.019	0.031	0.039	945.00	9.59	10.71	15.38
(0.10,0.60,0.30)	0.392	0.500	0.590	0.954	0.013	0.023	0.031	954.00	3.15	3.59	7.79
(0.00,0.60,0.40)	0.000	0.000	0.506	0.963	0.000	0.000	0.023	963.00	0.00	0.00	0.16
(0.30,0.70,0.00)	0.606	0.746	0.858	0.931	0.029	0.042	0.052	931.50	19.78	21.89	27.22
(0.20,0.70,0.10)	0.546	0.672	0.774	0.941	0.023	0.035	0.044	940.50	13.34	14.79	19.65
(0.10,0.70,020)	0.487	0.598	0.690	0.950	0.017	0.027	0.036	949.50	6.90	7.67	12.08
(0.00,0.70,0.30)	0.427	0.523	0.606	0.959	0.010	0.020	0.027	958.50	0.46	0.51	4.48
(0.20,0.80,0.00)	0.641	0.769	0.874	0.936	0.027	0.039	0.048	936.00	17.09	18.85	23.94
(0.10,0.80,0.10)	0.582	0.695	0.790	0.945	0.020	0.031	0.040	945.00	10.65	11.75	16.36
(0.00,0.80,0.20)	0.522	0.621	0.707	0.954	0.014	0.024	0.032	954.00	4.21	4.60	8.77
(0.10,0.90,0.00)	0.677	0.793	0.891	0.941	0.024	0.036	0.045	940.50	14.40	15.82	20.64
(0.00,0.90,0.10)	0.617	0.719	0.807	0.950	0.018	0.028	0.036	949.50	7.96	8.68	13.04
(0.00,1.00,0.00)	0.712	0.816	0.907	0.945	0.021	0.032	0.041	945.00	11.71	12.74	17.32

Table E.9a: Simulation Results for the Set of Parameters: $n = 1000$, $t = 5, d = 50$, $\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.900, 0.945, 0.950)$

(s_{01}, s_{02}, s_{03})	F			$\overline{R^*}$			$\overline{T^*}$		
	$a_f = 1$	$a_f = 7$	$a_f = 10$	$a_f = 1$	$a_f = 7$	$a_f = 10$	$a_f = 1$	$a_f = 7$	$a_f = 10$
(1.00,0.00,0.00)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.90,0.00,0.10)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.80,0.00,0.20)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.70,0.00,0.30)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.60,0.00,0.40)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.50,0.00,0.50)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.40,0.00,0.60)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.30,0.00,0.70)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.20,0.00,0.80)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.00,0.90)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.00,1.00)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.90,0.10,0.00)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.80,0.10,0.10)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.70,0.10,0.20)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.60,0.10,0.30)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.50,0.10,0.40)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.40,0.10,0.50)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.30,0.10,0.60)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.20,0.10,0.70)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.10,0.80)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.10,0.90)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.80,0.20,0.00)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.70,0.20,0.10)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.60,0.20,0.20)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.50,0.20,0.30)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.40,0.20,0.40)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.30,0.20,0.50)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.20,0.20,0.60)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.20,0.70)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.20,0.80)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.70,0.30,0.00)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.60,0.30,0.10)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.50,0.30,0.20)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00

Table E.9a : (continued)

(s_{01}, s_{02}, s_{03})	F			$\overline{R^*}$			$\overline{T^*}$		
	$a_f = 1$	$a_f = 7$	$a_f = 10$	$a_f = 1$	$a_f = 7$	$a_f = 10$	$a_f = 1$	$a_f = 7$	$a_f = 10$
(0.40,0.30,0.30)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.30,0.30,0.40)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.20,0.30,0.50)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.30,0.60)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.30,0.70)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.60,0.40,0.00)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.50,0.40,0.10)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.40,0.40,0.20)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.30,0.40,0.30)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.20,0.40,0.40)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.40,0.50)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.40,0.60)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.50,0.50,0.00)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.40,0.50,0.10)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.30,0.50,0.20)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.20,0.50,0.30)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.50,0.40)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.50,0.50)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.40,0.60,0.00)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.30,0.60,0.10)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.20,0.60,0.20)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.60,0.30)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.60,0.40)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.30,0.70,0.00)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.20,0.70,0.10)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.70,020)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.70,0.30)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.20,0.80,0.00)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.80,0.10)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.80,0.20)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.90,0.00)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.90,0.10)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,1.00,0.00)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00

Table E.9b: Simulation Results for the Set of Parameters: $n = 1000,\ t = 5, d = 50,$
$\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.900, 0.945, 0.900)$

(s_{01}, s_{02}, s_{03})	$\overline{s_3^* - s_{03}}$			$r(\underline{s}_0)$	$\overline{r(\underline{s}^*) - r(\underline{s}_0)}$			V_0	$\overline{V^* - V_0}$		
	a_f				a_f				a_f		
	1.0	7.0	10.0		1.0	7.0	10.0		1.0	7.0	10.0
(1.00.0.00,0.00)	0.356	0.356	0.356	0.900	0.048	0.048	0.048	900.00	0.69	0.69	0.69
(0.90.0.00,0.10)	0.000	0.000	0.000	0.909	0.000	0.000	0.000	909.00	0.00	0.00	0.00
(0.80.0.00,0.20)	0.000	0.000	0.000	0.918	0.000	0.000	0.000	918.00	0.00	0.00	0.00
(0.70,0.00,0.30)	0.000	0.000	0.000	0.927	0.000	0.000	0.000	927.00	0.00	0.00	0.00
(0.60,0.00,0.40)	0.000	0.000	0.000	0.936	0.000	0.000	0.000	936.00	0.00	0.00	0.00
(0.50,0.00,0.50)	0.000	0.000	0.000	0.945	0.000	0.000	0.000	945.00	0.00	0.00	0.00
(0.40,0.00,0.60)	0.000	0.000	0.000	0.954	0.000	0.000	0.000	954.00	0.00	0.00	0.00
(0.30,0.00,0.70)	0.000	0.000	0.000	0.963	0.000	0.000	0.000	963.00	0.00	0.00	0.00
(0.20,0.00,0.80)	0.000	0.000	0.000	0.972	0.000	0.000	0.000	972.00	0.00	0.00	0.00
(0.10,0.00,0.90)	0.000	0.000	0.000	0.981	0.000	0.000	0.000	981.00	0.00	0.00	0.00
(0.00,0.00,1.00)	0.000	0.000	0.000	0.990	0.000	0.000	0.000	990.00	0.00	0.00	0.00
(0.90,0.10,0.00)	0.000	0.000	0.000	0.905	0.000	0.000	0.000	904.50	0.00	0.00	0.00
(0.80,0.10,0.10)	0.000	0.000	0.000	0.914	0.000	0.000	0.000	913.50	0.00	0.00	0.00
(0.70,0.10,0.20)	0.000	0.000	0.000	0.923	0.000	0.000	0.000	922.50	0.00	0.00	0.00
(0.60,0.10,0.30)	0.000	0.000	0.000	0.932	0.000	0.000	0.000	931.50	0.00	0.00	0.00
(0.50,0.10,0.40)	0.000	0.000	0.000	0.941	0.000	0.000	0.000	940.50	0.00	0.00	0.00
(0.40,0.10,0.50)	0.000	0.000	0.000	0.950	0.000	0.000	0.000	949.50	0.00	0.00	0.00
(0.30,0.10.0.60)	0.000	0.000	0.000	0.959	0.000	0.000	0.000	958.50	0.00	0.00	0.00
(0.20,0.10,0.70)	0.000	0.000	0.000	0.968	0.000	0.000	0.000	967.50	0.00	0.00	0.00
(0.10,0.10,0.80)	0.000	0.000	0.000	0.977	0.000	0.000	0.000	976.50	0.00	0.00	0.00
(0.00,0.10,0.90)	0.000	0.000	0.000	0.986	0.000	0.000	0.000	985.50	0.00	0.00	0.00
(0.80,0.20,0.00)	0.000	0.000	0.000	0.909	0.000	0.000	0.000	909.00	0.00	0.00	0.00
(0.70,0.20,0.10)	0.000	0.000	0.000	0.918	0.000	0.000	0.000	918.00	0.00	0.00	0.00
(0.60,0.20,0.20)	0.000	0.000	0.000	0.927	0.000	0.000	0.000	927.00	0.00	0.00	0.00
(0.50,0.20,0.30)	0.000	0.000	0.000	0.936	0.000	0.000	0.000	936.00	0.00	0.00	0.00
(0.40,0.20,0.40)	0.000	0.000	0.000	0.945	0.000	0.000	0.000	945.00	0.00	0.00	0.00
(0.30,0.20,0.50)	0.000	0.000	0.000	0.954	0.000	0.000	0.000	954.00	0.00	0.00	0.00
(0.20,0.20,0.60)	0.000	0.000	0.000	0.963	0.000	0.000	0.000	963.00	0.00	0.00	0.00
(0.10,0.20,0.70)	0.000	0.000	0.000	0.972	0.000	0.000	0.000	972.00	0.00	0.00	0.00
(0.00,0.20,0.80)	0.000	0.000	0.000	0.981	0.000	0.000	0.000	981.00	0.00	0.00	0.00
(0.70,0.30,0.00)	0.000	0.000	0.000	0.913	0.000	0.000	0.000	913.50	0.00	0.00	0.00
(0.60,0.30,0.10)	0.000	0.000	0.000	0.923	0.000	0.000	0.000	922.50	0.00	0.00	0.00
(0.50,0.30,0.20)	0.000	0.000	0.000	0.931	0.000	0.000	0.000	931.50	0.00	0.00	0.00

Table E.9b: (continued)

(s_{01}, s_{02}, s_{03})	$\overline{s_3^* - s_{03}}$			$r(\underline{s}_0)$	$\overline{r(\underline{s}^*) - r(\underline{s}_0)}$			V_0	$\overline{V^* - V_0}$		
	a_f				a_f				a_f		
	1.0	7.0	10.0		1.0	7.0	10.0		1.0	7.0	10.0
(0.40,0.30,0.30)	0.000	0.000	0.000	0.941	0.000	0.000	0.000	940.50	0.000	0.000	0.000
(0.30,0.30,0.40)	0.000	0.000	0.000	0.950	0.000	0.000	0.000	949.50	0.000	0.000	0.000
(0.20,0.30,0.50)	0.000	0.000	0.000	0.959	0.000	0.000	0.000	958.50	0.000	0.000	0.000
(0.10,0.30,0.60)	0.000	0.000	0.000	0.968	0.000	0.000	0.000	967.50	0.000	0.000	0.000
(0.00,0.30,0.70)	0.000	0.000	0.000	0.976	0.000	0.000	0.000	976.50	0.000	0.000	0.000
(0.60,0.40,0.00)	0.000	0.000	0.000	0.918	0.000	0.000	0.000	918.00	0.000	0.000	0.000
(0.50,0.40,0.10)	0.000	0.000	0.000	0.927	0.000	0.000	0.000	927.00	0.000	0.000	0.000
(0.40,0.40,0.20)	0.000	0.000	0.000	0.936	0.000	0.000	0.000	936.00	0.000	0.000	0.000
(0.30,0.40,0.30)	0.000	0.000	0.000	0.945	0.000	0.000	0.000	945.00	0.000	0.000	0.000
(0.20,0.40,0.40)	0.000	0.000	0.000	0.954	0.000	0.000	0.000	954.00	0.000	0.000	0.000
(0.10,0.40,0.50)	0.000	0.000	0.000	0.963	0.000	0.000	0.000	963.00	0.000	0.000	0.000
(0.00,0.40,0.60)	0.000	0.000	0.000	0.972	0.000	0.000	0.000	972.00	0.000	0.000	0.000
(0.50,0.50,0.00)	0.000	0.000	0.000	0.922	0.000	0.000	0.000	922.50	0.000	0.000	0.000
(0.40,0.50,0.10)	0.000	0.000	0.000	0.931	0.000	0.000	0.000	931.50	0.000	0.000	0.000
(0.30,0.50,0.20)	0.000	0.000	0.000	0.940	0.000	0.000	0.000	940.50	0.000	0.000	0.000
(0.20,0.50,0.30)	0.000	0.000	0.000	0.950	0.000	0.000	0.000	949.50	0.000	0.000	0.000
(0.10,0.50,0.40)	0.000	0.000	0.000	0.959	0.000	0.000	0.000	958.50	0.000	0.000	0.000
(0.00,0.50,0.50)	0.000	0.000	0.000	0.968	0.000	0.000	0.000	967.50	0.000	0.000	0.000
(0.40,0.60,0.00)	0.000	0.000	0.000	0.927	0.000	0.000	0.000	927.00	0.000	0.000	0.000
(0.30,0.60,0.10)	0.000	0.000	0.000	0.936	0.000	0.000	0.000	936.00	0.000	0.000	0.000
(0.20,0.60,0.20)	0.000	0.000	0.000	0.945	0.000	0.000	0.000	945.00	0.000	0.000	0.000
(0.10,0.60,0.30)	0.000	0.000	0.000	0.954	0.000	0.000	0.000	954.00	0.000	0.000	0.000
(0.00,0.60,0.40)	0.000	0.000	0.000	0.963	0.000	0.000	0.000	963.00	0.000	0.000	0.000
(0.30,0.70,0.00)	0.000	0.000	0.000	0.931	0.000	0.000	0.000	931.50	0.000	0.000	0.000
(0.20,0.70,0.10)	0.000	0.000	0.000	0.941	0.000	0.000	0.000	940.50	0.000	0.000	0.000
(0.10,0.70,020)	0.000	0.000	0.000	0.950	0.000	0.000	0.000	949.50	0.000	0.000	0.000
(0.00,0.70,0.30)	0.000	0.000	0.000	0.959	0.000	0.000	0.000	958.50	0.000	0.000	0.000
(0.20,0.80,0.00)	0.000	0.000	0.000	0.936	0.000	0.000	0.000	936.00	0.000	0.000	0.000
(0.10,0.80,0.10)	0.000	0.000	0.000	0.945	0.000	0.000	0.000	945.00	0.000	0.000	0.000
(0.00,0.80,0.20)	0.000	0.000	0.000	0.954	0.000	0.000	0.000	954.00	0.000	0.000	0.000
(0.10,0.90,0.00)	0.000	0.000	0.000	0.941	0.000	0.000	0.000	940.50	0.000	0.000	0.000
(0.00,0.90,0.10)	0.000	0.000	0.000	0.950	0.000	0.000	0.000	949.50	0.000	0.000	0.000
(0.00,1.00,0.00)	0.000	0.000	0.000	0.945	0.000	0.000	0.000	945.00	0.000	0.000	0.000

Table E.10a : Simulation Results for the Set of Parameters: $n = 1000$, $t = 2.5, d = 5$, $\underline{u}_a(g = 0.05, f = 0.25)$, and $\underline{r} = (0.900,0.945,0.950)$

(s_{01}, s_{02}, s_{03})	F			$\overline{R^*}$			$\overline{T^*}$		
	$a_f=1$	$a_f=7$	$a_f=10$	$a_f=1$	$a_f=7$	$a_f=10$	$a_f=1$	$a_f=7$	$a_f=10$
(1.00,0.00,0.00)	3.0	3.0	3.0	1.00	4.17	5.91	0.00	5.77	5.91
(0.90,0.00,0.10)	3.0	2.0	2.0	1.00	3.65	5.39	0.00	6.68	6.39
(0.80,0.00,0.20)	1.0	2.0	2.0	0.00	3.09	4.81	0.00	5.70	5.81
(0.70,0.00,0.30)	1.0	2.0	2.0	0.00	2.67	4.26	0.00	5.46	5.26
(0.60,0.00,0.40)	1.0	2.0	2.0	0.00	2.27	3.52	0.00	4.92	5.15
(0.50,0.00,0.50)	1.0	2.0	2.0	0.00	1.37	2.92	0.00	3.50	4.46
(0.40,0.00,0.60)	1.0	2.0	2.0	0.00	1.11	2.34	0.00	3.05	3.79
(0.30,0.00,0.70)	1.0	1.0	2.0	0.00	0.00	1.76	0.00	0.00	3.12
(0.20,0.00,0.80)	1.0	1.0	2.0	0.00	0.00	1.21	0.00	0.00	2.49
(0.10,0.00,0.90)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.00,1.00)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.90,0.10,0.00)	3.0	3.0	3.0	1.00	4.14	5.87	0.00	5.73	5.87
(0.80,0.10,0.10)	3.0	2.0	2.0	1.00	3.29	5.08	0.00	5.95	6.08
(0.70,0.10,0.20)	1.0	2.0	2.0	0.00	2.80	4.51	0.00	5.59	5.51
(0.60,0.10,0.30)	1.0	2.0	2.0	0.00	1.92	3.96	0.00	3.67	4.96
(0.50,0.10,0.40)	1.0	2.0	2.0	0.00	1.66	3.07	0.00	3.30	4.66
(0.40,0.10,0.50)	1.0	1.0	2.0	0.00	0.00	2.49	0.00	0.00	3.98
(0.30,0.10,0.60)	1.0	1.0	2.0	0.00	0.00	1.92	0.00	0.00	3.33
(0.20,0.10,0.70)	1.0	1.0	2.0	0.00	0.00	1.36	0.00	0.00	2.69
(0.10,0.10,0.80)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.10,0.90)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.80,0.20,0.00)	3.0	3.0	3.0	1.00	4.11	5.82	0.00	5.70	5.82
(0.70,0.20,0.10)	1.0	2.0	2.0	0.00	3.15	4.78	0.00	5.78	5.78
(0.60,0.20,0.20)	1.0	2.0	2.0	0.00	2.05	4.22	0.00	3.84	5.22
(0.50,0.20,0.30)	1.0	2.0	2.0	0.00	1.78	3.24	0.00	3.47	4.87
(0.40,0.20,0.40)	1.0	1.0	2.0	0.00	0.00	2.64	0.00	0.00	4.18
(0.30,0.20,0.50)	1.0	1.0	2.0	0.00	0.00	2.06	0.00	0.00	3.52
(0.20,0.20,0.60)	1.0	1.0	2.0	0.00	0.00	1.52	0.00	0.00	2.89
(0.10,0.20,0.70)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.20,0.80)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.70,0.30,0.00)	3.0	3.0	3.0	1.00	4.08	5.78	0.00	5.66	5.78
(0.60,0.30,0.10)	1.0	2.0	2.0	0.00	2.18	4.48	0.00	4.02	5.48
(0.50,0.30,0.20)	1.0	1.0	2.0	0.00	0.00	3.91	0.00	0.00	4.91

Table E.10a : (continued)

(s_{01}, s_{02}, s_{03})	F			$\overline{R^*}$			$\overline{T^*}$		
	$a_f=1$	$a_f=7$	$a_f=10$	$a_f=1$	$a_f=7$	$a_f=10$	$a_f=1$	$a_f=7$	$a_f=10$
(0.40,0.30,0.30)	1.0	1.0	2.0	0.00	0.00	2.81	0.00	0.00	4.40
(0.30,0.30,0.40)	1.0	1.0	2.0	0.00	0.00	2.22	0.00	0.00	3.72
(0.20,0.30,0.50)	1.0	1.0	2.0	0.00	0.00	1.67	0.00	0.00	3.08
(0.10,0.30,0.60)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.30,0.70)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.60,0.40,0.00)	1.0	3.0	3.0	0.00	4.05	5.74	0.00	5.63	5.74
(0.50,0.40,0.10)	1.0	1.0	2.0	0.00	0.00	4.18	0.00	0.00	5.18
(0.40,0.40,0.20)	1.0	1.0	2.0	0.00	0.00	3.62	0.00	0.00	4.62
(0.30,0.40,0.30)	1.0	1.0	2.0	0.00	0.00	2.39	0.00	0.00	3.93
(0.20,0.40,0.40)	1.0	1.0	2.0	0.00	0.00	1.83	0.00	0.00	3.28
(0.10,0.40,0.50)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.40,0.60)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.50,0.50,0.00)	1.0	1.0	3.0	0.00	0.00	5.69	0.00	0.00	5.69
(0.40,0.50,0.10)	1.0	1.0	2.0	0.00	0.00	3.89	0.00	0.00	4.89
(0.30,0.50,0.20)	1.0	1.0	2.0	0.00	0.00	2.56	0.00	0.00	4.15
(0.20,0.50,0.30)	1.0	1.0	2.0	0.00	0.00	2.00	0.00	0.00	3.50
(0.10,0.50,0.40)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.50,0.50)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.40,0.60,0.00)	1.0	1.0	3.0	0.00	0.00	5.64	0.00	0.00	5.64
(0.30,0.60,0.10)	1.0	1.0	2.0	0.00	0.00	3.61	0.00	0.00	4.61
(0.20,0.60,0.20)	1.0	1.0	2.0	0.00	0.00	2.17	0.00	0.00	3.72
(0.10,0.60,0.30)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.60,0.40)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.30,0.70,0.00)	1.0	1.0	3.0	0.00	0.00	5.59	0.00	0.00	5.59
(0.20,0.70,0.10)	1.0	1.0	2.0	0.00	0.00	2.33	0.00	0.00	3.92
(0.10,0.70,020)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.70,0.30)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.20,0.80,0.00)	1.0	1.0	2.0	0.00	0.00	3.60	0.00	0.00	4.60
(0.10,0.80,0.10)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.80,0.20)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.10,0.90,0.00)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,0.90,0.10)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.00,1.00,0.00)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00

Table E.10b : Simulation Results for the Set of Parameters: $n = 1000$, $t = 2.5, d = 5$, $\underline{u}_a(g = 0.05, f = 0.25)$, and $\underline{r} = (0.900, 0.945, 0.950)$

(s_{01}, s_{02}, s_{03})	$\overline{s_3^* - s_{03}}$			$r(\underline{s}_0)$	$\overline{r(\underline{s}^*) - r(\underline{s}_0)}$			V_0	$\overline{V^* - V_0}$		
	a_f				a_f				a_f		
	1.0	7.0	10.0		1.0	7.0	10.0		1.0	7.0	10.0
(1.00,0.00,0.00)	0.119	0.471	0.686	0.900	0.016	0.051	0.076	900.00	11.45	17.56	32.34
(0.90,0.00,0.10)	0.036	0.402	0.615	0.909	0.010	0.044	0.068	909.00	5.02	10.55	26.07
(0.80,0.00,0.20)	0.000	0.328	0.544	0.918	0.000	0.036	0.061	918.00	0.00	7.87	22.55
(0.70,0.00,0.30)	0.000	0.287	0.473	0.927	0.000	0.032	0.053	927.00	0.00	5.72	18.86
(0.60,0.00,0.40)	0.000	0.239	0.414	0.936	0.000	0.026	0.046	936.00	0.00	3.79	15.57
(0.50,0.00,0.50)	0.000	0.158	0.346	0.945	0.000	0.017	0.038	945.00	0.00	1.98	12.57
(0.40,0.00,0.60)	0.000	0.126	0.275	0.954	0.000	0.014	0.030	954.00	0.00	0.77	9.33
(0.30,0.00,0.70)	0.000	0.000	0.206	0.963	0.000	0.000	0.023	963.00	0.00	0.00	6.13
(0.20,0.00,0.80)	0.000	0.000	0.135	0.972	0.000	0.000	0.015	972.00	0.00	0.00	2.68
(0.10,0.00,0.90)	0.000	0.000	0.000	0.981	0.000	0.000	0.000	981.00	0.00	0.00	0.00
(0.00,0.00,1.00)	0.000	0.000	0.000	0.990	0.000	0.000	0.000	990.00	0.00	0.00	0.00
(0.90,0.10,0.00)	0.131	0.478	0.692	0.905	0.012	0.047	0.072	904.50	7.70	13.73	28.41
(0.80,0.10,0.10)	0.047	0.367	0.586	0.914	0.006	0.037	0.062	913.50	1.28	7.34	22.50
(0.70,0.10,0.20)	0.000	0.313	0.515	0.923	0.000	0.032	0.055	922.50	0.00	5.07	18.91
(0.60,0.10,0.30)	0.000	0.208	0.444	0.932	0.000	0.021	0.047	931.50	0.00	2.97	15.24
(0.50,0.10,0.40)	0.000	0.173	0.366	0.941	0.000	0.017	0.039	940.50	0.00	1.38	12.27
(0.40,0.10,0.50)	0.000	0.000	0.297	0.950	0.000	0.000	0.031	949.50	0.00	0.00	9.13
(0.30,0.10,0.60)	0.000	0.000	0.227	0.959	0.000	0.000	0.024	958.50	0.00	0.00	5.87
(0.20,0.10,0.70)	0.000	0.000	0.158	0.968	0.000	0.000	0.016	967.50	0.00	0.00	2.46
(0.10,0.10,0.80)	0.000	0.000	0.000	0.977	0.000	0.000	0.000	976.50	0.00	0.00	0.00
(0.00,0.10,0.90)	0.000	0.000	0.000	0.986	0.000	0.000	0.000	985.50	0.00	0.00	0.00
(0.80,0.20,0.00)	0.142	0.485	0.697	0.909	0.009	0.043	0.067	909.00	3.96	9.88	24.47
(0.70,0.20,0.10)	0.000	0.358	0.558	0.918	0.000	0.033	0.057	918.00	0.00	4.42	18.87
(0.60,0.20,0.20)	0.000	0.231	0.486	0.927	0.000	0.022	0.049	927.00	0.00	2.52	15.29
(0.50,0.20,0.30)	0.000	0.196	0.387	0.936	0.000	0.018	0.040	936.00	0.00	0.93	11.87
(0.40,0.20,0.40)	0.000	0.000	0.318	0.945	0.000	0.000	0.032	945.00	0.00	0.00	8.88
(0.30,0.20,0.50)	0.000	0.000	0.249	0.954	0.000	0.000	0.025	954.00	0.00	0.00	5.69
(0.20,0.20,0.60)	0.000	0.000	0.180	0.963	0.000	0.000	0.017	963.00	0.00	0.00	2.24
(0.10,0.20,0.70)	0.000	0.000	0.000	0.972	0.000	0.000	0.000	972.00	0.00	0.00	0.00
(0.00,0.20,0.80)	0.000	0.000	0.000	0.981	0.000	0.000	0.000	981.00	0.00	0.00	0.00
(0.70,0.30,0.00)	0.154	0.491	0.702	0.913	0.005	0.039	0.063	913.50	0.22	6.04	20.50
(0.60,0.30,0.10)	0.000	0.254	0.529	0.923	0.000	0.022	0.051	922.50	0.00	2.05	15.25
(0.50,0.30,0.20)	0.000	0.000	0.457	0.931	0.000	0.000	0.043	931.50	0.00	0.00	11.70

Table E.10b : (continued)

(s_{01}, s_{02}, s_{03})	$\overline{s_3^* - s_{03}}$			$r(\underline{s}_0)$	$\overline{r(\underline{s}^*) - r(\underline{s}_0)}$			V_0	$\overline{V^* - V_0}$		
	a_f				a_f				a_f		
	1.0	7.0	10.0		1.0	7.0	10.0		1.0	7.0	10.0
(0.40,0.30,0.30)	0.000	0.000	0.340	0.941	0.000	0.000	0.033	940.50	0.000	0.00	8.50
(0.30,0.30,0.40)	0.000	0.000	0.272	0.950	0.000	0.000	0.026	949.50	0.000	0.00	5.47
(0.20,0.30,0.50)	0.000	0.000	0.203	0.959	0.000	0.000	0.018	958.50	0.000	0.00	2.08
(0.10,0.30,0.60)	0.000	0.000	0.000	0.968	0.000	0.000	0.000	967.50	0.000	0.00	0.00
(0.00,0.30,0.70)	0.000	0.000	0.000	0.976	0.000	0.000	0.000	976.50	0.000	0.00	0.00
(0.60,0.40,0.00)	0.000	0.498	0.707	0.918	0.000	0.035	0.059	918.00	0.000	2.18	16.54
(0.50,0.40,0.10)	0.000	0.000	0.500	0.927	0.000	0.000	0.045	927.00	0.000	0.00	11.66
(0.40,0.40,0.20)	0.000	0.000	0.429	0.936	0.000	0.000	0.037	936.00	0.000	0.00	8.01
(0.30,0.40,0.30)	0.000	0.000	0.293	0.945	0.000	0.000	0.027	945.00	0.000	0.00	5.11
(0.20,0.40,0.40)	0.000	0.000	0.225	0.954	0.000	0.000	0.019	954.00	0.000	0.00	1.88
(0.10,0.40,0.50)	0.000	0.000	0.000	0.963	0.000	0.000	0.000	963.00	0.000	0.00	0.00
(0.00,0.40,0.60)	0.000	0.000	0.000	0.972	0.000	0.000	0.000	972.00	0.000	0.00	0.00
(0.50,0.50,0.00)	0.000	0.000	0.713	0.922	0.000	0.000	0.055	922.50	0.000	0.00	12.62
(0.40,0.50,0.10)	0.000	0.000	0.472	0.931	0.000	0.000	0.039	931.50	0.000	0.00	8.00
(0.30,0.50,0.20)	0.000	0.000	0.314	0.940	0.000	0.000	0.028	940.50	0.000	0.00	4.71
(0.20,0.50,0.30)	0.000	0.000	0.248	0.950	0.000	0.000	0.020	949.50	0.000	0.00	1.54
(0.10,0.50,0.40)	0.000	0.000	0.000	0.959	0.000	0.000	0.000	958.50	0.000	0.00	0.00
(0.00,0.50,0.50)	0.000	0.000	0.000	0.968	0.000	0.000	0.000	967.50	0.000	0.00	0.00
(0.40,0.60,0.00)	0.000	0.000	0.718	0.927	0.000	0.000	0.050	927.00	0.000	0.00	8.73
(0.30,0.60,0.10)	0.000	0.000	0.444	0.936	0.000	0.000	0.033	936.00	0.000	0.00	4.35
(0.20,0.60,0.20)	0.000	0.000	0.269	0.945	0.000	0.000	0.021	945.00	0.000	0.00	1.17
(0.10,0.60,0.30)	0.000	0.000	0.000	0.954	0.000	0.000	0.000	954.00	0.000	0.00	0.00
(0.00,0.60,0.40)	0.000	0.000	0.000	0.963	0.000	0.000	0.000	963.00	0.000	0.00	0.00
(0.30,0.70,0.00)	0.000	0.000	0.723	0.931	0.000	0.000	0.046	931.50	0.000	0.00	4.81
(0.20,0.70,0.10)	0.000	0.000	0.291	0.941	0.000	0.000	0.022	940.50	0.000	0.00	0.89
(0.10,0.70,020)	0.000	0.000	0.000	0.950	0.000	0.000	0.000	949.50	0.000	0.00	0.00
(0.00,0.70,0.30)	0.000	0.000	0.000	0.959	0.000	0.000	0.000	958.50	0.000	0.00	0.00
(0.20,0.80,0.00)	0.000	0.000	0.461	0.936	0.000	0.000	0.030	936.00	0.000	0.00	0.69
(0.10,0.80,0.10)	0.000	0.000	0.000	0.945	0.000	0.000	0.000	945.00	0.000	0.00	0.00
(0.00,0.80,0.20)	0.000	0.000	0.000	0.954	0.000	0.000	0.000	954.00	0.000	0.00	0.00
(0.10,0.90,0.00)	0.000	0.000	0.000	0.941	0.000	0.000	0.000	940.50	0.000	0.00	0.00
(0.00,0.90,0.10)	0.000	0.000	0.000	0.950	0.000	0.000	0.000	949.50	0.000	0.00	0.00
(0.00,1.00,0.00)	0.000	0.000	0.000	0.945	0.000	0.000	0.000	945.00	0.000	0.00	0.00

Table E.11a : Simulation Results for the Set of Parameters: $n = 1000$, $t = 2.5, d = 5$, $\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.900, 0.945, 0.950)$

(s_{01}, s_{02}, s_{03})	F			$\overline{R^*}$			$\overline{T^*}$		
	$a_f = 1$	$a_f = 7$	$a_f = 10$	$a_f = 1$	$a_f = 7$	$a_f = 10$	$a_f = 1$	$a_f = 7$	$a_f = 10$
(1.00.0.00,0.00)	3.0	3.0	3.0	2.00	2.66	2.64	0.00	2.87	1.64
(0.90.0.00,0.10)	3.0	3.0	3.0	2.00	2.65	2.63	0.00	2.86	1.63
(0.80.0.00,0.20)	3.0	3.0	2.0	2.00	2.64	2.14	0.00	2.85	2.32
(0.70.0.00,0.30)	3.0	2.0	2.0	2.00	1.94	1.89	0.00	4.36	2.17
(0.60,0.00,0.40)	3.0	2.0	2.0	2.00	1.67	1.65	0.00	3.90	2.02
(0.50,0.00,0.50)	3.0	2.0	2.0	2.00	1.45	1.41	0.00	3.81	1.87
(0.40,0.00,0.60)	3.0	2.0	2.0	1.00	1.07	1.18	0.00	3.08	1.73
(0.30,0.00,0.70)	1.0	2.0	2.0	0.00	0.85	0.79	0.00	2.90	1.86
(0.20,0.00,0.80)	1.0	2.0	2.0	0.00	0.49	0.54	0.00	2.90	1.61
(0.10,0.00,0.90)	1.0	2.0	2.0	0.00	0.20	0.28	0.00	1.51	1.37
(0.00,0.00,1.00)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.90,0.10,0.00)	3.0	3.0	3.0	2.00	2.65	2.63	0.00	2.87	1.63
(0.80,0.10,0.10)	3.0	3.0	3.0	2.00	2.64	2.62	0.00	2.85	1.62
(0.70,0.10,0.20)	3.0	3.0	3.0	2.00	2.63	1.95	0.00	2.84	2.50
(0.60,0.10,0.30)	3.0	3.0	2.0	2.00	1.76	1.77	0.00	3.03	2.09
(0.50,0.10,0.40)	3.0	2.0	2.0	2.00	1.48	1.52	0.00	3.87	1.94
(0.40,0.10,0.50)	3.0	2.0	2.0	1.00	1.16	1.30	0.00	3.06	1.80
(0.30,0.10.0.60)	3.0	2.0	2.0	1.00	0.78	0.74	0.00	3.21	1.74
(0.20,0.10,0.70)	1.0	2.0	2.0	0.00	0.62	0.57	0.00	2.96	1.57
(0.10,0.10,0.80)	1.0	2.0	2.0	0.00	0.28	0.40	0.00	1.48	1.40
(0.00,0.10,0.90)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.80,0.20,0.00)	3.0	3.0	3.0	2.00	2.65	2.62	0.00	2.86	1.62
(0.70,0.20,0.10)	3.0	3.0	3.0	2.00	2.63	1.96	0.00	2.84	2.50
(0.60,0.20,0.20)	3.0	3.0	3.0	2.00	1.77	1.75	0.00	3.02	1.75
(0.50,0.20,0.30)	3.0	3.0	3.0	2.00	1.72	1.70	0.00	2.96	1.70
(0.40,0.20,0.40)	3.0	3.0	2.0	2.00	1.68	0.98	0.00	2.90	1.98
(0.30,0.20,0.50)	3.0	2.0	2.0	1.00	0.85	0.81	0.00	3.31	1.81
(0.20,0.20,0.60)	1.0	2.0	2.0	0.00	0.67	0.64	0.00	2.89	1.64
(0.10,0.20,0.70)	1.0	2.0	2.0	0.00	0.33	0.47	0.00	1.57	1.47
(0.00,0.20,0.80)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.70,0.30,0.00)	3.0	3.0	3.0	2.00	2.64	1.97	0.00	2.85	2.51
(0.60,0.30,0.10)	3.0	3.0	3.0	2.00	1.82	1.76	0.00	3.27	1.76
(0.50,0.30,0.20)	3.0	3.0	3.0	2.00	1.77	1.72	0.00	3.19	1.72

Table E.11a : (continued)

(s_{01}, s_{02}, s_{03})	F			$\overline{R^*}$			$\overline{T^*}$		
	$a_f=1$	$a_f=7$	$a_f=10$	$a_f=1$	$a_f=7$	$a_f=10$	$a_f=1$	$a_f=7$	$a_f=10$
(0.40,0.30,0.30)	3.0	3.0	3.0	2.00	1.70	1.67	0.00	2.92	1.67
(0.30,0.30,0.40)	3.0	3.0	3.0	1.00	1.65	1.63	0.00	2.87	1.63
(0.20,0.30,0.50)	3.0	2.0	2.0	1.00	0.75	0.89	0.00	3.02	2.48
(0.10,0.30,0.60)	1.0	2.0	2.0	0.00	0.60	0.54	0.00	2.83	1.54
(0.00,0.30,0.70)	1.0	1.0	2.0	0.00	0.00	0.39	0.00	0.00	1.42
(0.60,0.40,0.00)	3.0	3.0	3.0	2.00	1.84	1.78	0.00	3.29	1.78
(0.50,0.40,0.10)	3.0	3.0	3.0	2.00	1.79	1.73	0.00	3.22	1.73
(0.40,0.40,0.20)	3.0	3.0	3.0	2.00	1.74	1.69	0.00	3.15	1.69
(0.30,0.40,0.30)	3.0	3.0	3.0	1.00	1.70	1.64	0.00	3.08	1.64
(0.20,0.40,0.40)	3.0	3.0	3.0	1.00	1.62	1.59	0.00	2.82	1.59
(0.10,0.40,0.50)	3.0	3.0	2.0	1.00	1.57	0.83	0.00	2.76	2.47
(0.00,0.40,0.60)	1.0	1.0	2.0	0.00	0.00	0.69	0.00	0.00	2.44
(0.50,0.50,0.00)	3.0	3.0	3.0	2.00	1.80	1.75	0.00	3.24	1.75
(0.40,0.50,0.10)	3.0	3.0	3.0	2.00	1.76	1.70	0.00	3.17	1.70
(0.30,0.50,0.20)	3.0	3.0	3.0	1.00	1.71	1.66	0.00	3.10	1.66
(0.20,0.50,0.30)	3.0	3.0	3.0	1.00	1.66	1.61	0.00	3.03	1.61
(0.10,0.50,0.40)	3.0	3.0	3.0	1.00	1.61	1.56	0.00	2.95	1.56
(0.00,0.50,0.50)	1.0	3.0	3.0	0.00	1.47	1.52	0.00	2.78	1.52
(0.40,0.60,0.00)	3.0	3.0	3.0	2.00	1.77	1.72	0.00	3.19	1.72
(0.30,0.60,0.10)	3.0	3.0	3.0	2.00	1.72	1.67	0.00	3.12	1.67
(0.20,0.60,0.20)	3.0	3.0	3.0	1.00	1.67	1.62	0.00	3.05	1.62
(0.10,0.60,0.30)	3.0	3.0	3.0	1.00	1.62	1.58	0.00	2.97	1.58
(0.00,0.60,0.40)	3.0	3.0	3.0	1.00	1.51	1.53	0.00	2.96	1.53
(0.30,0.70,0.00)	3.0	3.0	3.0	2.00	1.74	1.69	0.00	3.14	1.69
(0.20,0.70,0.10)	3.0	3.0	3.0	1.00	1.69	1.64	0.00	3.07	1.64
(0.10,0.70,020)	3.0	3.0	3.0	1.00	1.64	1.59	0.00	2.99	1.59
(0.00,0.70,0.30)	3.0	3.0	3.0	1.00	1.56	1.54	0.00	3.02	1.54
(0.20,0.80,0.00)	3.0	3.0	3.0	1.00	1.71	1.66	0.00	3.09	1.66
(0.10,0.80,0.10)	3.0	3.0	3.0	1.00	1.65	1.61	0.00	3.01	1.61
(0.00,0.80,0.20)	3.0	3.0	3.0	1.00	1.58	1.63	0.00	3.04	1.71
(0.10,0.90,0.00)	3.0	3.0	3.0	1.00	1.67	1.62	0.00	3.03	1.62
(0.00,0.90,0.10)	3.0	3.0	3.0	1.00	1.59	1.65	0.00	3.06	1.73
(0.00,1.00,0.00)	3.0	3.0	3.0	1.00	1.61	1.68	0.00	3.08	1.75

Table E.11b : Simulation Results for the Set of Parameters: $n = 1000$, $t = 2.5, d = 5$, $\underline{u}_b(g = 0.05, f = 0.75)$, and $\underline{r} = (0.900, 0.945, 0.950)$

(s_{01}, s_{02}, s_{03})	$\overline{s_3^* - s_{03}}$			$r(\underline{s}_0)$	$\overline{r(\underline{s}^*) - r(\underline{s}_0)}$			V_0	$\overline{V^* - V_0}$		
	a_f				a_f				a_f		
	1.0	7.0	10.0		1.0	7.0	10.0		1.0	7.0	10.0
(1.00,0.00,0.00)	0.628	0.851	0.859	0.900	0.064	0.082	0.084	900.00	54.18	61.61	66.27
(0.90,0.00,0.10)	0.536	0.754	0.762	0.909	0.055	0.073	0.075	909.00	45.79	52.85	57.47
(0.80,0.00,0.20)	0.444	0.656	0.686	0.918	0.047	0.064	0.067	918.00	37.40	44.09	50.43
(0.70,0.00,0.30)	0.352	0.584	0.599	0.927	0.039	0.056	0.058	927.00	29.01	35.90	43.56
(0.60,0.00,0.40)	0.260	0.490	0.512	0.936	0.030	0.047	0.050	936.00	20.62	29.17	36.68
(0.50,0.00,0.50)	0.168	0.405	0.425	0.945	0.022	0.039	0.042	945.00	12.24	22.41	29.79
(0.40,0.00,0.60)	0.000	0.302	0.338	0.954	0.010	0.029	0.033	954.00	4.80	16.31	22.78
(0.30,0.00,0.70)	0.000	0.224	0.258	0.963	0.000	0.022	0.025	963.00	0.00	10.37	16.23
(0.20,0.00,0.80)	0.000	0.147	0.171	0.972	0.000	0.014	0.017	972.00	0.00	4.59	9.64
(0.10,0.00,0.90)	0.000	0.057	0.085	0.981	0.000	0.006	0.008	981.00	0.00	0.34	3.11
(0.00,0.00,1.00)	0.000	0.000	0.000	0.990	0.000	0.000	0.000	990.00	0.00	0.00	0.00
(0.90,0.10,0.00)	0.631	0.852	0.860	0.905	0.060	0.077	0.079	904.50	50.04	57.23	61.85
(0.80,0.10,0.10)	0.539	0.755	0.762	0.914	0.051	0.069	0.070	913.50	41.65	48.47	53.06
(0.70,0.10,0.20)	0.447	0.657	0.651	0.923	0.043	0.060	0.061	922.50	33.26	39.71	44.96
(0.60,0.10,0.30)	0.356	0.506	0.560	0.932	0.035	0.048	0.052	931.50	24.87	31.92	38.10
(0.50,0.10,0.40)	0.264	0.458	0.473	0.941	0.026	0.042	0.044	940.50	16.48	24.38	31.25
(0.40,0.10,0.50)	0.095	0.347	0.386	0.950	0.013	0.031	0.035	949.50	8.54	17.89	24.27
(0.30,0.10,0.60)	0.036	0.265	0.268	0.959	0.007	0.024	0.026	958.50	2.11	11.89	17.29
(0.20,0.10,0.70)	0.000	0.190	0.192	0.968	0.000	0.016	0.018	967.50	0.00	5.94	10.60
(0.10,0.10,0.80)	0.000	0.081	0.117	0.977	0.000	0.007	0.010	976.50	0.00	1.04	3.95
(0.00,0.10,0.90)	0.000	0.000	0.000	0.986	0.000	0.000	0.000	985.50	0.00	0.00	0.00
(0.80,0.20,0.00)	0.635	0.853	0.860	0.909	0.056	0.073	0.075	909.00	45.90	52.85	57.44
(0.70,0.20,0.10)	0.543	0.756	0.750	0.918	0.047	0.064	0.065	918.00	37.51	44.09	49.34
(0.60,0.20,0.20)	0.451	0.604	0.609	0.927	0.039	0.052	0.054	927.00	29.12	36.23	41.19
(0.50,0.20,0.30)	0.359	0.519	0.525	0.936	0.030	0.044	0.046	936.00	20.73	28.41	33.23
(0.40,0.20,0.40)	0.267	0.435	0.394	0.945	0.022	0.036	0.036	945.00	12.34	20.56	25.73
(0.30,0.20,0.50)	0.131	0.320	0.319	0.954	0.011	0.026	0.028	954.00	5.86	13.70	19.08
(0.20,0.20,0.60)	0.000	0.238	0.243	0.963	0.000	0.018	0.020	963.00	0.00	7.76	12.38
(0.10,0.20,0.70)	0.000	0.116	0.167	0.972	0.000	0.008	0.012	972.00	0.00	2.10	5.71
(0.00,0.20,0.80)	0.000	0.000	0.000	0.981	0.000	0.000	0.000	981.00	0.00	0.00	0.00
(0.70,0.30,0.00)	0.639	0.854	0.849	0.913	0.051	0.069	0.070	913.50	41.76	48.47	53.71
(0.60,0.30,0.10)	0.547	0.715	0.709	0.923	0.043	0.058	0.059	922.50	33.37	40.57	45.59
(0.50,0.30,0.20)	0.455	0.630	0.625	0.931	0.035	0.049	0.051	931.50	24.98	32.76	37.64

Table E.11b : (continued)

(s_{01}, s_{02}, s_{03})	$\overline{s_3^* - s_{03}}$			$r(\underline{s}_0)$	$\overline{r(\underline{s}^*) - r(\underline{s}_0)}$			V_0	$\overline{V^* - V_0}$		
	a_f				a_f				a_f		
	1.0	7.0	10.0		1.0	7.0	10.0		1.0	7.0	10.0
(0.40,0.30,0.30)	0.363	0.534	0.541	0.941	0.026	0.040	0.042	940.50	16.59	24.87	29.66
(0.30,0.30,0.40)	0.226	0.450	0.457	0.950	0.014	0.032	0.034	949.50	9.61	17.02	21.69
(0.20,0.30,0.50)	0.166	0.296	0.357	0.959	0.008	0.021	0.025	958.50	3.18	9.61	14.48
(0.10,0.30,0.60)	0.000	0.227	0.218	0.968	0.000	0.014	0.014	967.50	0.00	3.78	7.48
(0.00,0.30,0.70)	0.000	0.000	0.148	0.976	0.000	0.000	0.007	976.50	0.00	0.00	0.84
(0.60,0.40,0.00)	0.642	0.815	0.810	0.918	0.047	0.062	0.063	918.00	37.62	44.87	49.99
(0.50,0.40,0.10)	0.550	0.730	0.725	0.927	0.039	0.054	0.055	927.00	29.23	37.06	42.04
(0.40,0.40,0.20)	0.458	0.645	0.641	0.936	0.031	0.046	0.047	936.00	20.84	29.22	34.07
(0.30,0.40,0.30)	0.321	0.559	0.557	0.945	0.018	0.037	0.039	945.00	13.35	21.38	26.11
(0.20,0.40,0.40)	0.261	0.464	0.473	0.954	0.012	0.028	0.030	954.00	6.92	13.51	18.15
(0.10,0.40,0.50)	0.202	0.380	0.354	0.963	0.005	0.020	0.020	963.00	0.50	5.69	10.19
(0.00,0.40,0.60)	0.000	0.000	0.283	0.972	0.000	0.000	0.013	972.00	0.00	0.00	3.23
(0.50,0.50,0.00)	0.646	0.830	0.826	0.922	0.043	0.058	0.060	922.50	33.47	41.35	46.45
(0.40,0.50,0.10)	0.554	0.744	0.742	0.931	0.035	0.050	0.051	931.50	25.08	33.52	38.47
(0.30,0.50,0.20)	0.416	0.659	0.657	0.940	0.022	0.042	0.043	940.50	17.10	25.69	30.51
(0.20,0.50,0.30)	0.356	0.574	0.573	0.950	0.015	0.033	0.035	949.50	10.67	17.87	22.57
(0.10,0.50,0.40)	0.297	0.489	0.489	0.959	0.009	0.025	0.027	958.50	4.24	10.06	14.61
(0.00,0.50,0.50)	0.000	0.391	0.405	0.968	0.000	0.016	0.018	967.50	0.00	2.16	6.65
(0.40,0.60,0.00)	0.649	0.844	0.842	0.927	0.039	0.054	0.056	927.00	29.33	37.82	42.87
(0.30,0.60,0.10)	0.557	0.759	0.758	0.936	0.031	0.046	0.048	936.00	20.94	29.99	34.91
(0.20,0.60,0.20)	0.451	0.674	0.674	0.945	0.019	0.038	0.039	945.00	14.41	22.18	26.98
(0.10,0.60,0.30)	0.392	0.588	0.590	0.954	0.013	0.030	0.031	954.00	7.99	14.38	19.03
(0.00,0.60,0.40)	0.332	0.500	0.506	0.963	0.006	0.021	0.023	963.00	1.56	6.53	11.07
(0.30,0.70,0.00)	0.653	0.858	0.858	0.931	0.035	0.051	0.052	931.50	25.19	34.28	39.31
(0.20,0.70,0.10)	0.546	0.773	0.774	0.941	0.023	0.042	0.044	940.50	18.16	26.48	31.38
(0.10,0.70,020)	0.487	0.688	0.690	0.950	0.017	0.034	0.036	949.50	11.73	18.69	23.44
(0.00,0.70,0.30)	0.427	0.605	0.606	0.959	0.010	0.026	0.027	958.50	5.31	10.86	15.49
(0.20,0.80,0.00)	0.641	0.873	0.874	0.936	0.027	0.047	0.048	936.00	21.90	30.77	35.78
(0.10,0.80,0.10)	0.582	0.788	0.790	0.945	0.020	0.039	0.040	945.00	15.48	22.98	27.84
(0.00,0.80,0.20)	0.522	0.705	0.722	0.954	0.014	0.030	0.033	954.00	9.05	15.18	19.87
(0.10,0.90,0.00)	0.677	0.887	0.891	0.941	0.024	0.043	0.045	940.50	19.22	27.27	32.24
(0.00,0.90,0.10)	0.617	0.805	0.826	0.950	0.018	0.035	0.037	949.50	12.80	19.49	24.33
(0.00,1.00,0.00)	0.712	0.905	0.929	0.945	0.021	0.039	0.042	945.00	16.54	23.79	28.79

Table E.12a: Simulation Results for the Set of Parameters: $n = 1000$, $t = 2.5, d = 5$, $\underline{u}_c(g = 0.05, f = 1.00)$, and $\underline{r} = (0.900, 0.945, 0.950)$

(s_{01}, s_{02}, s_{03})	F			$\overline{R^*}$			$\overline{T^*}$		
	$a_f=1$	$a_f=7$	$a_f=10$	$a_f=1$	$a_f=7$	$a_f=10$	$a_f=1$	$a_f=7$	$a_f=10$
(1.00,0.00,0.00)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.90,0.00,0.10)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.80,0.00,0.20)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.70,0.00,0.30)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.60,0.00,0.40)	3.0	3.0	2.0	2.00	2.00	1.26	0.00	0.00	1.00
(0.50,0.00,0.50)	3.0	3.0	2.0	2.00	2.00	1.08	0.00	0.00	1.00
(0.40,0.00,0.60)	3.0	3.0	2.0	2.00	2.00	0.91	0.00	0.00	1.00
(0.30,0.00,0.70)	3.0	3.0	2.0	2.00	2.00	0.73	0.00	0.00	1.00
(0.20,0.00,0.80)	3.0	2.0	2.0	1.00	0.59	0.41	0.00	1.80	1.28
(0.10,0.00,0.90)	3.0	2.0	2.0	1.00	0.27	0.22	0.00	1.00	1.19
(0.00,0.00,1.00)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.90,0.10,0.00)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.80,0.10,0.10)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.70,0.10,0.20)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.60,0.10,0.30)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.50,0.10,0.40)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.40,0.10,0.50)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.30,0.10,0.60)	3.0	3.0	2.0	2.00	2.00	0.82	0.00	0.00	1.00
(0.20,0.10,0.70)	3.0	3.0	2.0	1.00	1.00	0.65	0.00	0.00	1.00
(0.10,0.10,0.80)	3.0	3.0	2.0	1.00	1.00	0.47	0.00	0.00	1.00
(0.00,0.10,0.90)	1.0	1.0	1.0	0.00	0.00	0.00	0.00	0.00	0.00
(0.80,0.20,0.00)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.70,0.20,0.10)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.60,0.20,0.20)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.50,0.20,0.30)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.40,0.20,0.40)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.30,0.20,0.50)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.20,0.20,0.60)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.10,0.20,0.70)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.00,0.20,0.80)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.70,0.30,0.00)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.60,0.30,0.10)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.50,0.30,0.20)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00

Table E.12a : (continued)

(s_{01}, s_{02}, s_{03})	F			$\overline{R^*}$			$\overline{T^*}$		
	$a_f=1$	$a_f=7$	$a_f=10$	$a_f=1$	$a_f=7$	$a_f=10$	$a_f=1$	$a_f=7$	$a_f=10$
(0.40,0.30,0.30)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.30,0.30,0.40)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.20,0.30,0.50)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.10,0.30,0.60)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.00,0.30,0.70)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.60,0.40,0.00)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.50,0.40,0.10)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.40,0.40,0.20)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.30,0.40,0.30)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.20,0.40,0.40)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.10,0.40,0.50)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.00,0.40,0.60)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.50,0.50,0.00)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.40,0.50,0.10)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.30,0.50,0.20)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.20,0.50,0.30)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.10,0.50,0.40)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.00,0.50,0.50)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.40,0.60,0.00)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.30,0.60,0.10)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.20,0.60,0.20)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.10,0.60,0.30)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.00,0.60,0.40)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.30,0.70,0.00)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.20,0.70,0.10)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.10,0.70,020)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.00,0.70,0.30)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.20,0.80,0.00)	3.0	3.0	3.0	2.00	2.00	2.00	0.00	0.00	0.00
(0.10,0.80,0.10)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.00,0.80,0.20)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.10,0.90,0.00)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.00,0.90,0.10)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00
(0.00,1.00,0.00)	3.0	3.0	3.0	1.00	1.00	1.00	0.00	0.00	0.00

Table E.12b: Simulation Results for the Set of Parameters: $n = 1000$, $t = 2.5, d = 5$, $\underline{u}_c(g = 0.05, f = 1.00)$, and $\underline{r} = (0.900, 0.945, 0.950)$

(s_{01}, s_{02}, s_{03})	$\overline{s_3^* - s_{03}}$			$r(\underline{s}_0)$	$\overline{r(\underline{s}^*) - r(\underline{s}_0)}$			V_0	$\overline{V^* - V_0}$		
	a_f				a_f				a_f		
	1.0	7.0	10.0		1.0	7.0	10.0		1.0	7.0	10.0
(1.00,0.00,0.00)	0.950	0.950	0.950	0.900	0.088	0.088	0.088	900.00	77.76	77.76	77.76
(0.90,0.00,0.10)	0.855	0.855	0.855	0.909	0.079	0.079	0.079	909.00	69.00	69.00	69.00
(0.80,0.00,0.20)	0.760	0.760	0.760	0.918	0.070	0.070	0.070	918.00	60.23	60.23	60.23
(0.70,0.00,0.30)	0.665	0.665	0.665	0.927	0.061	0.061	0.061	927.00	51.46	51.46	51.46
(0.60,0.00,0.40)	0.570	0.570	0.570	0.936	0.053	0.053	0.053	936.00	42.70	42.70	43.41
(0.50,0.00,0.50)	0.475	0.475	0.475	0.945	0.044	0.044	0.044	945.00	33.93	33.93	35.53
(0.40,0.00,0.60)	0.380	0.380	0.380	0.954	0.035	0.035	0.035	954.00	25.16	25.16	27.62
(0.30,0.00,0.70)	0.285	0.285	0.285	0.963	0.026	0.026	0.026	963.00	16.40	16.40	19.71
(0.20,0.00,0.80)	0.095	0.173	0.190	0.972	0.013	0.016	0.018	972.00	7.90	8.50	11.98
(0.10,0.00,0.90)	0.047	0.067	0.095	0.981	0.006	0.006	0.009	981.00	1.48	1.84	4.33
(0.00,0.00,1.00)	0.000	0.000	0.000	0.990	0.000	0.000	0.000	990.00	0.00	0.00	0.00
(0.90,0.10,0.00)	0.955	0.955	0.955	0.905	0.083	0.083	0.083	904.50	73.48	73.48	73.48
(0.80,0.10,0.10)	0.860	0.860	0.860	0.914	0.075	0.075	0.075	913.50	64.72	64.72	64.72
(0.70,0.10,0.20)	0.765	0.765	0.765	0.923	0.066	0.066	0.066	922.50	55.95	55.95	55.95
(0.60,0.10,0.30)	0.670	0.670	0.670	0.932	0.057	0.057	0.057	931.50	47.19	47.19	47.19
(0.50,0.10,0.40)	0.575	0.575	0.575	0.941	0.048	0.048	0.048	940.50	38.42	38.42	38.42
(0.40,0.10,0.50)	0.480	0.480	0.480	0.950	0.040	0.040	0.040	949.50	29.65	29.65	29.65
(0.30,0.10,0.60)	0.385	0.385	0.340	0.959	0.031	0.031	0.029	958.50	20.89	20.89	21.74
(0.20,0.10,0.70)	0.190	0.190	0.245	0.968	0.017	0.017	0.020	967.50	12.18	12.18	13.83
(0.10,0.10,0.80)	0.143	0.143	0.150	0.977	0.011	0.011	0.011	976.50	5.75	5.75	5.94
(0.00,0.10,0.90)	0.000	0.000	0.000	0.986	0.000	0.000	0.000	985.50	0.00	0.00	0.00
(0.80,0.20,0.00)	0.960	0.960	0.960	0.909	0.079	0.079	0.079	909.00	69.21	69.21	69.21
(0.70,0.20,0.10)	0.864	0.864	0.864	0.918	0.070	0.070	0.070	918.00	60.44	60.44	60.44
(0.60,0.20,0.20)	0.769	0.769	0.769	0.927	0.062	0.062	0.062	927.00	51.67	51.67	51.67
(0.50,0.20,0.30)	0.675	0.675	0.675	0.936	0.053	0.053	0.053	936.00	42.91	42.91	42.91
(0.40,0.20,0.40)	0.580	0.580	0.580	0.945	0.044	0.044	0.044	945.00	34.14	34.14	34.14
(0.30,0.20,0.50)	0.484	0.484	0.484	0.954	0.035	0.035	0.035	954.00	25.38	25.38	25.38
(0.20,0.20,0.60)	0.389	0.389	0.389	0.963	0.027	0.027	0.027	963.00	16.61	16.61	16.61
(0.10,0.20,0.70)	0.238	0.238	0.238	0.972	0.015	0.015	0.015	972.00	10.03	10.03	10.03
(0.00,0.20,0.80)	0.190	0.190	0.190	0.981	0.009	0.009	0.009	981.00	3.60	3.60	3.60
(0.70,0.30,0.00)	0.964	0.964	0.964	0.913	0.075	0.075	0.075	913.50	64.93	64.93	64.93
(0.60,0.30,0.10)	0.869	0.869	0.869	0.923	0.066	0.066	0.066	922.50	56.16	56.16	56.16
(0.50,0.30,0.20)	0.774	0.774	0.774	0.931	0.057	0.057	0.057	931.50	47.40	47.40	47.40

Table E.12b : (continued)

(s_{01}, s_{02}, s_{03})	$\overline{s_3^* - s_{03}}$			$r(\underline{s}_0)$	$\overline{r(\underline{s}^*) - r(\underline{s}_0)}$			V_0	$\overline{V^* - V_0}$		
	a_f				a_f				a_f		
	1.0	7.0	10.0		1.0	7.0	10.0		1.0	7.0	10.0
(0.40,0.30,0.30)	0.679	0.679	0.679	0.941	0.049	0.049	0.049	940.50	38.63	38.63	38.63
(0.30,0.30,0.40)	0.584	0.584	0.584	0.950	0.040	0.040	0.040	949.50	29.86	29.86	29.86
(0.20,0.30,0.50)	0.489	0.489	0.489	0.959	0.031	0.031	0.031	958.50	21.10	21.10	21.10
(0.10,0.30,0.60)	0.332	0.332	0.332	0.968	0.019	0.019	0.019	967.50	14.30	14.30	14.30
(0.00,0.30,0.70)	0.285	0.285	0.285	0.976	0.013	0.013	0.013	976.50	7.88	7.88	7.88
(0.60,0.40,0.00)	0.969	0.969	0.969	0.918	0.071	0.071	0.071	918.00	60.65	60.65	60.65
(0.50,0.40,0.10)	0.874	0.874	0.874	0.927	0.062	0.062	0.062	927.00	51.89	51.89	51.89
(0.40,0.40,0.20)	0.779	0.779	0.779	0.936	0.053	0.053	0.053	936.00	43.12	43.12	43.12
(0.30,0.40,0.30)	0.684	0.684	0.684	0.945	0.044	0.044	0.044	945.00	34.35	34.35	34.35
(0.20,0.40,0.40)	0.589	0.589	0.589	0.954	0.035	0.035	0.035	954.00	25.59	25.59	25.59
(0.10,0.40,0.50)	0.428	0.428	0.428	0.963	0.024	0.024	0.024	963.00	18.58	18.58	18.58
(0.00,0.40,0.60)	0.380	0.380	0.380	0.972	0.017	0.017	0.017	972.00	12.15	12.15	12.15
(0.50,0.50,0.00)	0.974	0.974	0.974	0.922	0.066	0.066	0.066	922.50	56.37	56.37	56.37
(0.40,0.50,0.10)	0.879	0.879	0.879	0.931	0.057	0.057	0.057	931.50	47.61	47.61	47.61
(0.30,0.50,0.20)	0.784	0.784	0.784	0.940	0.049	0.049	0.049	940.50	38.84	38.84	38.84
(0.20,0.50,0.30)	0.689	0.689	0.689	0.950	0.040	0.040	0.040	949.50	30.08	30.08	30.08
(0.10,0.50,0.40)	0.523	0.523	0.523	0.959	0.028	0.028	0.028	958.50	22.86	22.86	22.86
(0.00,0.50,0.50)	0.475	0.475	0.475	0.968	0.021	0.021	0.021	967.50	16.43	16.43	16.43
(0.40,0.60,0.00)	0.979	0.979	0.979	0.927	0.062	0.062	0.062	927.00	52.10	52.10	52.10
(0.30,0.60,0.10)	0.883	0.883	0.883	0.936	0.053	0.053	0.053	936.00	43.33	43.33	43.33
(0.20,0.60,0.20)	0.788	0.788	0.788	0.945	0.044	0.044	0.044	945.00	34.57	34.57	34.57
(0.10,0.60,0.30)	0.617	0.617	0.617	0.954	0.032	0.032	0.032	954.00	27.13	27.13	27.13
(0.00,0.60,0.40)	0.570	0.570	0.570	0.963	0.026	0.026	0.026	963.00	20.71	20.71	20.71
(0.30,0.70,0.00)	0.983	0.983	0.983	0.931	0.058	0.058	0.058	931.50	47.82	47.82	47.82
(0.20,0.70,0.10)	0.888	0.888	0.888	0.941	0.049	0.049	0.049	940.50	39.05	39.05	39.05
(0.10,0.70,020)	0.712	0.712	0.712	0.950	0.036	0.036	0.036	949.50	31.41	31.41	31.41
(0.00,0.70,0.30)	0.665	0.665	0.665	0.959	0.030	0.030	0.030	958.50	24.98	24.98	24.98
(0.20,0.80,0.00)	0.988	0.988	0.988	0.936	0.053	0.053	0.053	936.00	43.54	43.54	43.54
(0.10,0.80,0.10)	0.808	0.808	0.808	0.945	0.041	0.041	0.041	945.00	35.68	35.68	35.68
(0.00,0.80,0.20)	0.760	0.760	0.760	0.954	0.034	0.034	0.034	954.00	29.26	29.26	29.26
(0.10,0.90,0.00)	0.903	0.903	0.903	0.941	0.045	0.045	0.045	940.50	39.96	39.96	39.96
(0.00,0.90,0.10)	0.855	0.855	0.855	0.950	0.038	0.038	0.038	949.50	33.54	33.54	33.54
(0.00,1.00,0.00)	0.950	0.950	0.950	0.945	0.043	0.043	0.043	945.00	37.81	37.81	37.81

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