DEPARTMENT OF ECONOMICS

WORKING PAPER SERIES

2016-05

McMASTER UNIVERSITY

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**Test-bedding the Replacement of the Incurred Credit Loss Model with an
Expected Credit Loss Model: The Case of Trade Receivables**

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25 May 2016

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Abstract

We use a laboratory-controlled environment to provide experimental evidence on the potential intended and unintended consequences of the mandatory replacement of the *Incurred Credit Loss Model* (ICL) of IAS 39 by the *Expected Credit Loss Model* (ECL) of IFRS 9. We focus on the simplified version of the ECL model using the case of allowances for trade-receivable losses as the context. In particular, we induce incentives consistent with the existing backward-looking rule-based ICL model and the proposed forward-looking ECL model. We find that eliminating the minimum “probable” threshold condition combined with allowing managers to use *forward-looking* information significantly improve the adequacy of credit loss allowances and their recognition in a more timely manner. This leads to higher profits over the economic cycle compared to an environment characterized by the ICL model. However, compensation incentives lead to higher levels of earnings management and dampening profits relative to the baseline case that maximizes the profits over the economic cycle. Taken together, we interpret our findings to indicate that while the replacement of the ICL model with the ECL model has the potential to mitigate the severity of the adverse effects of the ICL model, it could entail unintended consequences for earnings management. With this new ECL model still in the pre-implementation stage, our results provide ex-ante evidence to policymakers on the advantages of the ECL model as well as about the unintended outcomes provided by its inherent incentives.

Key words: Credit loss models; Expected credit loss; Incurred credit loss; Credit loss allowance; Earnings management; Adequacy of loss allowance; Pro-cyclical bias; Test-bedding rule changes

Test-bedding the Replacement of the Incurred Credit Loss Model with an Expected Credit Loss Model: The Case of Trade Receivables

1. Introduction

In the wake of the aftermath of the 2007/08 global financial crisis, numerous regulators, policy makers and accounting researchers raised significant concerns and criticisms that the accounting standards for financial instruments were partially responsible for exacerbating the severity and the length of the credit crisis. In their April 2009 Summit, the G-20 world leaders called on the International Accounting Standards Board (IASB) and the Financial Accounting Standards Board (FASB) to deal with the financial reporting issues arising from the accounting standards on valuation and provisioning the financial instruments which had been identified as part of the root causes of the financial crisis.¹ These issues were highlighted in a report by the U.S. Government Accountability Office (GAO) titled “Causes and Consequences of Recent Bank Failures” to the congressional committee.² This report states, “... early recognition of loan losses could have potentially reduced the procyclicality in the crisis”.

In response to these criticisms, the IASB and the FASB began in 2009 to work towards the development of their own versions of new financial instruments standards to replace the existing standards. In July 2014, the IASB issued its final and complete version of *Financial Instruments* (IFRS 9) to replace the IAS 39 effective for the annual periods beginning on or after 1 January 2018.

The IFRS 9 introduces, among other things, a new forward-looking principle-based *Expected Credit Loss Model* (ECL model) for recognizing and measuring impairment of financial

¹ G20 Communiqué: London Summit – Leaders' Statement; 2 April 2009.
https://www.imf.org/external/np/sec/pr/2009/pdf/g20_040209.pdf

² <http://www.gao.gov/assets/660/651154.pdf>

assets to replace the existing backward-looking rule-based *Incurred Credit Loss Model* (ICL model) required by IAS 39.³ The objective of the ECL model is to correct major weaknesses in the ICL model, namely (i) delaying the recognition of impairment losses until there is an objective evidence that the impairment of an asset is “probable” (i.e., probability of loss is at least 70%) and estimable, and (ii) prohibiting entities from using forward-looking information in estimating expected future events and conditions even if the loss is probable. These two features often result in building up too little credit loss reserves as well as in reinforcing the pro-cyclical bias, particularly during the recessionary phase of the economic cycle.⁴ The rationale of these two rigid requirements is to provide more objective measures of credit risk and to eliminate managerial discretion so as to remove any opportunity for earnings management.

To correct these weaknesses, the ECL model introduced, among other requirements, two major changes: (i) it eliminates the minimum “probable” threshold condition for the recognition of financial assets impairment and (ii) it requires managers to base their periodic estimates of credit loss provisions not only on past loss experiences and current conditions but also on forward-looking information about expected events and conditions. The IASB asserts that these changes are expected to enhance the adequacy (sufficiency) as well as the timeliness of the recognition of expected credit losses, and hence increase an entity’s loss absorbing capacity.

The application of the forward-looking information by its very nature requires managers to apply subjective judgment, exercise more managerial discretion and make assumptions about

³ The IASB has issued the IFRS 9 in three phases: the classification and measurement requirements (in 2009 and 2010), the hedge accounting model in 2013, and finally, the expected credit loss model is issued in July 2014. <http://www.ifrs.org/current-projects/iasb-projects/financial-instruments-a-replacement-of-ias-39-financial-instruments-recognition/documents/ifrs-9-project-summary-july-2014.pdf>.

⁴ Typically, under the ICL model, at the inception of and during the financial crisis, entities experience increases in realized losses while they do not have sufficient reserves to absorb these losses. The increased realized losses give rise to recognize more credit loss reserves at the peak and towards the end of the crisis that they may not need as they are exiting the crisis.

expected future events and conditions. This, in turn, may induce opportunistic managers to use this flexibility to manage (smooth) periodic earnings as to maximize their self-interest rather than improving the periodic estimates of credit loss allowances. Previous studies on earnings management (e.g., Jackson and Liu 2010; Chaeng et al. 2011) provide empirical evidence that firm managers tend to use credit loss provisions to maximize their compensation components that are directly linked to reported earnings. The forward-looking feature, therefore, could undermine the significance of the ECL model in achieving the desirable intended consequences and may lead to unintended adverse outcomes. Consequently, any gains from diminished pro-cyclicality could be offset by adverse effects from earnings management. Hence, one may argue that it is not clear whether the application of the ECL model will result in creating more adequate allowances as compared with ICL model.

The objective of this study is to use a controlled laboratory environment within which we can test-bed the mandatory replacement of the ICL model with the ECL model.⁵ We do this by first inducing incentives for decision makers consistent with the current ICL model and then changing the incentives to those in the proposed ECL model. More specifically, we pose the following two research questions. First, is the mandatory switching from ICL model to the ECL model expected to achieve its intended consequences – namely, increase the adequacy of estimating expected credit loss allowances and recognize them on a timelier basis? Second, to what extent are managers more likely to use their discretion in estimating expected credit loss allowances to manage earnings so as to achieve the maximization of their periodic compensation rather than maximizing long term profit of the firm?

⁵ There are many examples of controlled laboratory experiments being used to evaluate and test bed proposed rule changes (e.g., Hong and Plott 1982; Rassenti et al. 1994; Murphy et al. 2000; Kagel and Roth 2000; Cox et al. 2002; Cason and Gangadharan 2003; Haruvy et al. 2006; Brunner et al. 2010).

To address the above two research questions, we implement a 4x2 factorial design in a controlled laboratory environment. The first factor is implemented within subjects and represents the impairment models: the ICL model and three, increasingly flexible, ECL models. The second treatment is a between-subject factor with two different types of commonly used management compensation schemes that use either a flat-rate bonus based on reaching a profit target or a variable bonus based on profit over a well-defined range. The behavior under the two compensation schemes is also contrasted with the outcome associated with a simulated long-run profit maximization benchmark.

The development of a controlled laboratory environment for collecting data on the potential effects of replacing the ICL model with an ECL model is particularly relevant in the absence of archival or field data. It is worth noting that the IFRS 9 is effective in its entirety for periods beginning on or after 1 January 2018. Thus, the earliest time at which comprehensive archival data will be available for researchers to examine our research questions will be in 2019 or later. Moreover, IFRS 9 includes, in addition to the ECL model, two other standards: classification and measurement and a new hedge accounting model. It will be challenging for researchers to isolate the consequences of each standard separately. Isolating the consequences of the ECL model is further confounded by the fact that the IFRS 15 – Revenue From Contracts with Customers is also scheduled to be effective for the periods beginning on or after 1 January 2018.

For these reasons, we believe that the controlled laboratory method is appropriate to examine our research questions. Kachelmeier and King (2002) point out that while empirical-archival studies examine ex-post consequences of the implementation of accounting policies, the experimental method offers policymakers ex-ante insights of likely consequences of the new or proposed accounting policies and examine the incremental influence on decision makers, holding

all other influences constant. In addition, this method permits us to directly control for many variables that cannot be controlled using archival data and enables us to make causal inferences from directional changes in observed behavior. This approach, therefore, provides control and enables causal inferences from directional changes in observed behavior.

IFRS 9 introduced two versions of the ECL model: (i) a simplified model, which is applicable to trade receivables and other short-term assets that do not contain a significant financing component and (ii) a general (three-bucket) model, which is applicable to financial assets that have significant financing components and generate periodic interest revenues such as bank loans. Due to the complexity of the requirements of the general model, in this study we focus only on the simplified version of the ECL model using the case of allowances for trade-receivable losses as the context. To do so, we considerably simplify a very complex accounting standard and abstract from the naturally occurring environment so that we can isolate specific aspects of the new standard with a controlled laboratory environment within which we will be able to measure the incremental and combined effects of each of the two main features of the ECL model (i.e., eliminating the minimum threshold condition and allowing managers to use forward-looking information in their forecasts). Our controlled laboratory environment provides a test-bed for the new ECL model and introduces participants first to the ICL model and then incrementally modifies the environment to build two representations of the ECL model we believe are likely to be implemented. The participants take the roles of managers who must make periodic decisions regarding the reserves that they carry to account for potential future losses in a production and sales environment into which they are placed. The second treatment is the compensation scheme put in place to reward managers.

The results indicate that the replacement of the ICL model with an ECL model leads to increase in the adequacy of periodic credit loss provisions, increased profit over the economic cycle and a dampening of the downturns in the cycle. Increasing the flexibility of the ECL model by permitting decisions to carry reserves based on the likelihood of losses an extra year into future increases profit even further. However, the more flexible ECL rule does induce earnings management to meet short-term compensation targets rather than attempting to maximize long-run profit. The choice of a manager compensation scheme has a significant effect on the realized profit and earnings management.⁶

Our results could have several policy implications. For example, our results confirm the policy makers' intentions of introducing ECL model in that allowing for incorporation of forward looking information results in increase in the adequacy of loss reserves as well as dampening pro-cyclical behaviour. However, our results also demonstrate that allowing managers increased discretion may also trigger higher earnings management induced by compensation schemes in place. In particular, our results show that increase flexibility should be accompanied by proper incentive alignment of managers; otherwise some of the gains may be dampened by managerial myopia/opportunism.

The rest of this paper is organized as follows. We discuss the institutional background in the next section. We present the research design and our predictions in section three, discuss the results in section four and provide our conclusions in the final section.

2. Institutional Background

⁶ Since the major difference between the simplified and the general model for loan loss provisions is more or less the treatment of the interest component, the results obtained from the implementation of the impairment of trade receivables could be generalized (with caution) to loan loss provisions.

Credit loss provisioning practices in general, and bank loan loss reserves in particular, have been controversial and are constantly scrutinized by regulators and accounting standard setters.⁷ For example, in 1994, the U.S. Government Accountability Office (GAO) sharply criticized the banking industry for its loan loss accounting practices, claiming that reserves for loan losses could not be meaningfully compared because they were developed using methods that varied greatly in terms of the assessment of individual loans, the application of historical loss experience, and the inclusion of “supplemental” reserves not clearly linked to loan losses.⁸ The GAO recommended that reserves be directly linked to, and justified by, a comprehensive analysis of “current loss exposure” in the loan portfolio and that the periodic provision for loan losses adjust the reserve balance to the level determined to be necessary.

However, more recently, the focus of bank provisioning practices has shifted abruptly, partly in response to the perceived failure of banks, prior to the recent financial crisis, to anticipate losses not necessarily identifiable from current loss exposures (Dahl 2013). Laeven and Majnoni (2003) document that many banks delay provisioning for bad loans until it is too late — namely, when cyclical downturns have already set in — thereby magnifying the impact of economic cycles on bank stability. The Financial Stability Forum (FSF) recommended that bankers be given more latitude to exercise “reasonable judgments” in establishing provisions (FSF 2009). The U.S. Treasury (2009) similarly recommended that provisioning “incorporate a broader range of available credit information” and be more “forward-looking.” The FASB, in an apparent reversal of its earlier position, concurred with the proposed standards for loan loss provisioning

⁷ Comments that follow about bank loan loss reserves apply equally to credit loss provisioning.

⁸ Harris et al. (2013), among others, have criticized undue fears that subjectivity exhibited in recognizing potential losses before historical evidence indicates that the loss will occur could lead to the creation of “cookie jar” reserves by managers who want to distort the underlying economic activity and use these reserves to manage earnings and hide bad news.

incorporating expected losses (FASB 2011), as did the Basel Committee on Banking Supervision (BCBS 2011) and the International Accounting Standards Board (IASB 2011).

In the past, the IASB required international publicly-traded firms in more than 100 countries to use the International Accounting Standard (IAS) 39 to account for financial instruments. IAS 39 requires, among other things, that business entities should use the fair-value method to account for financial instruments and use the ICL model to account for credit (or loan) losses through the creation of a provision and an allowance or reserve account. Critics of the IAS 39 contend that the severity of the recent financial crisis of 2007-2008 and the collapse of many financial institutions have been escalated by the abnormally low levels of pre-crises accumulated loan loss provisions that were not sufficient to absorb the unexpected extraordinary credit losses incurred (Furlong and Knight 2010). Much of the problem of under-reserving was due to the restrictions imposed by the ICL model. As stated earlier, the major flaw of the ICL model is that it requires entities to delay the recognition of credit losses until these losses have actually incurred, even if management has high expectations that these losses are imminent. This under-reserving problem results in overstatement of both reported income and expected cash flows collectable from a loan, particularly in the early years of a loan's life, particularly for banks that have significant non-performing loans. This, in turn, results in a violation of the matching principle, increases the volatility of periodic income and the misrepresentation of financial statements.

Since 2009, the IASB has been working towards the development of new accounting standards for the impairment of financial instruments to overcome some of the weakness of the current system and to provide stakeholders with more accurate measures and earlier recognition of expected credit losses. On July 24, 2014 the IASB issued its final version of IFRS 9 which requires, among other things, that all entities should switch from the ICL model to an ECL model. In the

process of the estimation of periodic credit loss provisions and the recognition of impairment of financial instruments, the new model requires firms to consider not only credit losses that have already occurred but also the expected credit losses from the increase in risk exposure due to the deterioration in trustworthiness of the financial instrument from the time of the initial acquisition of the asset. Under the ECL model, therefore, entities should be able to detect any significant changes in the deterioration of the creditworthiness of financial instruments and account for them. This is intended to ensure that entities properly accrue all expected losses and accumulate adequate reserves during good years to absorb expected credit losses during bad years. Moreover, this new mechanism provides users of financial statements with more timely recognition of credit losses, more transparent financial statements and more decision-useful information.

ECL model, however, provides management with more flexibility to exercise discretion in estimating the effects of changes (improvement or deterioration) in credit risks on expected credit losses. The ECL model requires firm management to estimate and recognize the periodic credit losses for each category or stage or class of financial asset based on its assessment of the expected credit risk at the reporting date relative to the expected credit risk assigned to the asset when it was created. To do so, managers should use not only information about the past and current situations of each asset but also expected future public and private information. Consequently, under the ECL model, firm managers are required to use more judgment and exercise greater discretion in estimating the *amount* and *timing* of credit default risks than they would under the ICL model. Consequently, this feature of the new model may induce opportunistic managers to use this flexibility to manage (smooth) periodic earnings in such a way that maximizes their self-interest. The forward-looking feature, therefore, could be a double-edged sword that may undermine achieving the desirable intended consequences and lead to adverse unintended consequences.

3. Research Design and Predictions

3.1. The Implementation of the ICL and ECL Models

To examine, a priori, the consequences of implementing an accounting rule change, we develop a controlled laboratory environment within which we can capture the incentives and costs associated with the mandatory of the ICL model with the simplified ECL model.⁹ We use the controlled laboratory environment as the test-bed for the ECL model in an attempt to identify if the incentives that are created by the rule change actually lead to the expected results in a less complex environment than the naturally occurring environment (see references in footnote 5). This method permits us to directly control for many variables that cannot be controlled using archival data.

3.2. The Controlled Laboratory Environment

We create a hypothetical firm that produces and sells a product called *Alpha* through its several production plants. In each laboratory setting, participants take the role of the manager of one of these plants.¹⁰ To produce *Alpha*, the plant uses special equipment that is purchased and supplied by the firm's central administration. The equipment has a useful life of 10 decision periods and a production capacity of 700 units per period. In the descriptions that follow, each period is described as a fiscal year that starts on January 1st and ends on December 31st.

Due to its technical specifications, the productivity of the equipment is higher in the first seven years of its life than the last 3 years. At the end of the 10th year, the central management

⁹ The simplified ECL model is based on several operational simplifications and is applicable to trade receivables, contract assets and lease receivables that do not contain a significant financing component. This model requires that the firm should recognize lifetime expected credit losses when credit risk increases significantly compared to the credit risk anticipated when the asset was created.

¹⁰ The complete set of the instructions is included in Appendix A.

replaces the old equipment with new, but otherwise identical, equipment that will last for an additional 10 years. It has the same 700-unit per year production capacity. This process of replacing the equipment every 10 years will be repeated several times during the laboratory session.

Participants will not know how many 10-year cycles they will experience during the course of the session; participants know that the session will not run for more than 120 minutes. The 10-year productivity cycle is intended to induce in the participants an expectation that there will be “good times” with “high productivity” and there will be “bad times” with “low productivity” and these follow a regular pattern. However, the actual conditions that will be realized will not be known with certainty.

On September 1st of each year the plant manager will receive an order to produce 700 units of *Alpha* for sale and delivery between May and August of the next fiscal year, following a four-month storage period (January to April). The cost of producing each unit is 4 laboratory dollars (L\$). For simplicity, we ignore all other expenses related to production, selling and administration. The selling price for a unit of *Alpha* is L\$10. Thus, a plant earns revenues each year equal to L\$10 multiplied by the number of *Alpha* units produced with the corresponding cost of L\$4 per unit. This yields a maximum profit of L\$4,200 per period.

Although the plant’s target is to produce 700 units of *Alpha* each year, the nature of the production process normally yields a number of defective units called *Beta*. The number of *Beta* units that are expected from a production run of 700 units can vary significantly, depending on two factors: (i) the age of the equipment and (ii) the weather conditions prevailing during the storage stage of the production cycle.

3.2.1. The Role of *Beta* Units and *Fixer*

Beta units have a market value of L\$0. Consequently, each unit produced of *Beta* will cost the plant L\$4 to produce but will not generate any revenues. Thus, each unit of *Beta* will lower profit by L\$4 while each unit of *Alpha* increases profit by L\$6. The difference between an *Alpha* and a *Beta* unit is L\$10 in profit. The lower the number of *Beta* units the plant produces, the higher the profit realized by the plant. The firm is committed to maximize the profit for its shareholders. To motivate plant managers to achieve this objective, their compensation is conditioned by the plant's profit.

There exists a product called *Fixer* that is capable of repairing the deficient *Beta* units and converting them into *Alpha* units. *Fixer* comes in a spray can. Each can of *Fixer* costs the plant L\$6 and is capable of converting one unit of *Beta* into one unit of *Alpha*. The resulting *Alpha* will be sold for L\$10 with the net incremental gain of L\$4. The conversion process takes place during the final inspection of the output immediately prior to the delivery of the products to customers. As an illustrative example, consider that if the plant produces 600 units of *Alpha* and 100 units of *Beta* and does not have any stock of cans of *Fixer*, then none of the *Beta* units can be converted to *Alpha* and the plant will end up with profit of L\$3,200. However, if the manager had purchased 100 cans of *Fixer* in the previous fiscal year and used all of these to convert the 100 units of *Beta*, its profit would be L\$3,600. Thus, if the plant manager anticipated the possibility of *Beta* production and acquired *Fixer* at the appropriate time, the manager could have offset some of the reduction in profit associated with *Beta* production.

The uncertain production of *Beta* is comparable to the uncertain realization of a bad debt and ability to acquire *Fixer* is comparable to creating loan loss reserves in advance to offset the realization of the bad debt. It is into this environment that we introduce the ICL rules and ECL rules to examine how *Fixer* may be acquired and used. Figure 1 illustrates fiscal years and

production cycles. The first seven fiscal years of each ten-year cycle are high productivity years. The last three years are low productivity years.

Insert Figure 1 About Here

3.2.2. The Productivity Cycle, Weather Conditions and *Beta* Units

The first 10 fiscal years consist of a full cycle of 7 high-productivity years and 3 low-productivity years. The primary characteristic of the high-productivity years is that the likelihood of *Beta* production is relatively low and the amount of *Beta* produced, if it is produced, is relatively low. The likelihood of *Beta* production and the actual *Beta* production is introduced by linking them to the weather conditions that exist during the storage period at the start of the fiscal year. Table 1 presents the weather conditions as reflected by 18 combinations of temperature and humidity. Participants in the laboratory sessions are aware of this information.

Insert Table 1 About Here

Note that detailed weather conditions are identified by columns such as W1 or C2 and provide the likelihood that *Beta* will be produced and the amount that will be produced if the highest temperature (W1) or the middle of the lowest temperatures (C2) were realized and the humidity was low. With high humidity, *Beta* is never produced. As the temperature falls the amount of *Beta* that will be produced given low humidity rises. Also note that during years 8, 9 and 10 of the 10-year cycle if *Beta* is produced, more is produced at each temperature level than in the first seven years of the 10-year cycle.

To implement our laboratory environment, the computer software randomly draws a specific temperature condition for each year in the 10-year cycle before the start of the experiment. All participants in each session see the same series of temperature conditions and know that the draws were made in advance of the session. The random draws are made with replacement from the 9 possible temperature conditions presented in Table 1. The results of these draws for each round in each cycle are reported in Appendix B, Tables 3.1, 3.2 and 3.3 but are only revealed to the participants, one forecast at a time, at the end of each fiscal year. The rule governing the manager's ability to purchase *Fixer* will determine the way in which the forecast is reported to the manager. The actual *Beta* resulting from the production of 700 units during Stage I of a fiscal year is determined by a random draw based on the specific temperature condition even though the manager may have received a general forecast (the actual forecast may have been M3, but this may have been reported to the manager as M; the determination of *Beta* would be according to the likelihood of *Beta* given M3 and this outcome is also pre-determined).

At the end of each fiscal year, the manager receives a forecast of the weather condition for Stage 2 of the next fiscal year. At this time the manager is permitted to make a decision regarding the amount of *Fixer* to purchase for the subsequent fiscal year.¹¹ Once a decision is made regarding the *Fixer* to carry into the next fiscal year, the manager calculates the plant's profit for the fiscal year and the manager's compensation for the fiscal year. Decisions to utilize *Fixer* are made after Stage 2 of the following fiscal year.

3.2.3 Characteristics of the ICL Model for the Laboratory Environment

¹¹ Note that the rule that governs the amount of *Fixer* that may be purchased is a *treatment* factor that will vary according to the accounting rule.

Plant managers may purchase units of *Fixer* at the end of the fiscal year in which they produced units for sale in the next fiscal year. Only the general weather condition is reported to managers for Stage 2 of the next fiscal year. They are constrained to purchase *Fixer* only if there is at least a 70 percent chance that *Beta* will be identified in their production at the end of the storage period following production. If there is at least a 70 percent chance that *Beta* units will be identified, managers must purchase an amount of *Fixer* to convert the expected production of *Beta*. At the end of Stage 2, managers are informed of the actual *Beta* produced based on the specific condition that was determined for that period. If any *Beta* is produced, the manager must apply any *Fixer* available to convert units of *Beta* into units of *Alpha*. The manager may never purchase more *Fixer* in a fiscal year than the expected *Beta* production in the next fiscal year. If a manager has more *Fixer* at the end of a fiscal year than the expected *Beta* production in the next fiscal year, the manager may carry the surplus forward or return the surplus *Fixer* for a refund of the cost of the *Fixer*, which will be added to the current period's profit.

3.3 Characteristics of the ECL Models for the Laboratory Environment

3.3.1. ECL I

This rule eliminates the 70 percent the minimum threshold required under ICL that must be satisfied before *Fixer* may be purchased. In addition, upper and lower limits on the amount of *Fixer* that a manager may carry into the next fiscal year are established. The amount of *Fixer* that the manager must carry into the next fiscal year may not be less than the smaller of the historical average *Beta* production for the portion of the ten-year cycle in which the plant is currently operating (high productivity or low productivity) and the expected *Beta* production in the next fiscal year. As well, the manager may not carry more *Fixer* into the next fiscal year than the maximum of the two values described in the previous sentence and the manager's interim balance

of *Fixer* (the surplus described in sub-section 3.2.3). Managers receive general forecasts of the weather condition for the next fiscal year.

3.3.2. ECL II

This rule expands on ECL I by providing more detailed information about the likelihood that *Beta* will be produced in the next fiscal year and what the *Beta* production will be if any *Beta* is produced. Managers now receive specific forecasts of the weather condition for the next fiscal year.

3.3.3. ECL III

This rule expands on ECL II by expanding the information the manager receives about the likelihood of Beta production by providing a general forecast of the expected likelihood of Beta and the resulting Beta production for the fiscal year following the year for which the manager received the specific forecast introduced in ECL II. The rules governing the amount of *Fixer* that can be carried into the next fiscal year are also expanded to be at least equal to the largest of the following values and at most equal to the smallest of the following values:

- a) the “expected Beta units” based on the specific forecast for the upcoming fiscal year,
- b) the “expected Beta units” based on the general forecast of the fiscal year following the upcoming fiscal year and
- c) the historical average Beta units for the current fiscal year’s productivity condition.

The parameterization of the environments described in Appendix B, Tables 3.1, 3.2 and 3.3 are used to generate the minimum and maximum values for the *Fixer* that may be held as ending balances for each fiscal year (for carrying into the next fiscal year) under each credit loss rule by participants in the sessions that we run. Because the interim balance held by a manager prior purchasing *Fixer* in any fiscal year is determined by the decisions made by the manager in

previous fiscal years plus the realization of *Beta* in the current fiscal year, the maximum value of *Fixer* than may be carried into the next fiscal year will be unique to each manager in each environment and will evolve though out the session in which the manager participates. An example of the minimum and maximum values for the case in which the manager is compensated according to a profit-sharing scheme and in which the manager successfully purchases *Fixer* that will maximize the plant's long-run profit are presented in Appendix B, Table 3.4.

3.4. Characteristics of Manager Compensation Schemes for the Laboratory Environment

Two different manager compensation schemes are introduced to study the effect that replacing ICL with ECL has on opportunistic earnings management. Earnings management occurs when a manager makes decisions that maximize the manager's compensation rather than the firm's profits. The firm has the opportunity to select the manager compensation scheme and so it should be aware of the effects of the incentives it provides to its managers.

The following two managerial compensation schemes are implemented. The two-step compensation scheme provides a base salary if profits are positive and a bonus if profits exceed a threshold. The threshold is selected to be approximately the average of the profit over the 10-period cycle in the profit-maximizing benchmark environment. The second scheme is our approximation of the Healy (1985) bonus compensation scheme. This provides a small base salary but provides a bonus if profits exceed a threshold. The bonus is a percentage of the amount by which the threshold is exceeded. Once an upper limit of profit is reached the percentage bonus ends and for profit exceeding the upper limit, there is a fixed payment that makes compensation larger than at the upper limit, but not sensitive to further increases. It is anticipated that the second scheme will lead to more opportunistic earnings management than the first scheme. The specific schemes are described below:

- a) Two-Step Bonus: Managerial compensation is equal to L\$96 if plant profit exceeds zero and is increased to L\$146 if plant profit exceeds L\$2500.
- b) Healy Bonus: Managerial compensation is equal to L\$50 unless plant profit exceeds L\$2500. If plant profit exceeds L\$2500, compensation is equal to L\$50 plus 16.5% of the difference between plant profit and L\$2500 as long as plant profit does not exceed L\$4000. If plant profit exceeds L\$4000, managerial compensation is L\$300.

The values of the compensation schemes were selected to make the compensation received under the Incurred Credit Loss rule as close to one another as possible while at the same time not making it difficult for participants in the laboratory environments to easily calculate their compensation. Given the characteristics of the laboratory environment described above and the pre-determined values for weather conditions and *Beta* production, the managers compensation for a ten fiscal year cycle under the ICL model for the Two-Step and the Healy bonus schemes is L\$1,260.¹²

3.5. Baseline Simulations and Hypotheses

The rules-based standards such as the ICL model provide managers with precise bright-rules and detailed requirements that should be applied to all entities irrespective of the entities' unique circumstances. The fundamental advantage of principles-based accounting standards such as the ECL model is that it provides managers with broad guidelines that can be modified to fit each entities' unique characteristics and hence can be applied to variety of circumstances. The objective of the recommended replacement of the ICL model by the ECL model is to increase the likelihood that

¹² The parameters of the Healy Compensation Scheme were selected first. We selected as our ICL baseline income the average income that would be earned by a manager who made decisions consistent with the baseline decisions for this treatment over a full 10-period cycle. This value was L\$126. We then adjusted the fixed component of the Two-Step Compensation Scheme to assure the same average period income associated with a manager making decisions consistent with the baseline decisions for this treatment over a comparable 10-period cycle. Initially we set the fixed component of income to L\$100 for the Two-Step Scheme, but reduced it to L\$96 to generate an average period income of L\$126 during a complete ICL phase of the session. These numbers are presented in periods 11-20 in Appendix C, Tables C2 and C3.

managers will be able to better manage reserves so as to plan for uncertain future losses and offset dramatic reductions in profit. However, there is a recognition that the same tools that provide managers with flexibility to stabilize profits over a cycle also provide managers the opportunity to manipulate profits to meet objectives that may not contribute to the maximization of long-run profit. The laboratory environment that we describe earlier in this section is developed to provide an environment in which we can test-bed the efficacy of the ECL model in meeting the objectives for which the ECL model was proposed. We have implemented simulations of three baseline environments to evaluate the success of the laboratory environment we have created.

The first baseline evaluates the outcomes that would be realized with the implementation of our four credit loss models (ICL, ECL I, ECL II and ECL III) with a manager who is compensated with a share of the plant's profit and who successfully maximizes long-run profit. The second and third baselines replace the manager's compensation scheme with either the Two-Step or Healy Bonus described in sub-section 3.4. In the case of the both Two-Step Bonus and the Healy Bonus the manager makes decisions that assure that the maximum bonus is realized and then purchases the maximum *Fixer* possible.¹³

3.5.1. Results of Baseline Simulations for ICL and ECL Models with Profit Maximizing Managers and Managers under the Two-Step and Healy Bonus Schemes

The summary statistics for the three baseline simulations by credit loss models for desired ending balances, adequacy of *Fixer* purchased, quantity of earnings management and profit are presented in Figures 2, 3, 4 and 5.

The baseline predictions for the ICL and ECL models created for the controlled laboratory environment show that introducing an ECL model will result in greater average per period ending balances of *Fixer* over a 10 fiscal year productivity cycle than under the ICL model (see Figure 2).

¹³ Please see Appendix C for details of calculations.

The Two-Step compensation scheme shows much higher levels of average ending balances than does the Healy scheme. Neither are as great as the levels when the manager attempts to maximize long-run profit. This is also reflected by the adequacy measure in Figure 3. This measure reports the amount of Fixer purchased over the cycle relative to the number of Beta units taken out of storage in Stage 2 in each year over the cycle. This pattern of Fixer purchased is consistent with the earnings management reflected by the two compensation schemes (see Figure 4) which in turn is reflected by the higher profits earned in plants with managers compensated under the Two-Step scheme rather than the Healy scheme (see Figure 5). Because the per-period compensation potential is greater under the Healy scheme, there is more earnings management directed towards short-term profit maximization in order that the manager reaches the maximum possible bonus.

The results of the baseline simulations provide evidence that the environment we have created for the laboratory can yield results that reflect both the objectives of the ECL model (increased reserves and increased adequacy of reserves) and the concerns regarding the ECL model (increased earnings management). In our laboratory environment, in “ideal” conditions, the positive effects of the former outcome appear to outweigh the negative effects of the latter outcome. These values provide guidelines for evaluating the performance of participants in the controlled laboratory environment under different compensation schemes and different credit loss rules.

Insert Figures 2-5 About Here

3.5.3. Formal Hypotheses

The hypothesis tests are all presented as null hypotheses that there are no differences between treatment variables with alternative hypotheses that reflect the outcomes from the baseline

simulations. The ECL model eliminates the minimum probable threshold condition and allows managers to consider more forward looking information when estimating periodic allowances for credit losses. The rationale for these changes is to provide more adequate estimates of the allowance for doubtful accounts and to enhance timeliness of recognition of credit losses. The first hypothesis is that there is no difference between the loss provisions of the ECL and ICL models. Within the context of the laboratory environment, there will be no difference between *Fixer* carried under the ECL and ICL models. The relevant alternative hypothesis is

H1: Greater reserves will be carried under the ECL model than under the ICL model.

The second hypothesis is that there is no difference between the adequacies of the reserves held over a cycle under the ECL model as were held under ICL model.¹⁴ The relevant alternative hypothesis is

H2: Under the ECL model the adequacy of the *Fixer* purchased over a cycle will be greater than the adequacy of the *Fixer* purchased over the cycle under the ICL model.

As discussed before, the application of the forward-looking information by its very nature requires managers to apply subjective judgment, exercise more managerial discretion and make assumptions about expected future events and conditions. This, in turn, may induce opportunistic managers to use this flexibility to manage earnings as to maximize their self-interest based on the compensation structure in-place rather than improving the periodic estimates of credit loss allowances. Therefore, the third hypothesis is that there is no difference between the earnings

¹⁴ Adequacy is measured as the total *Fixer* purchased over the cycle divided by the total *Beta* produced over the cycle.

management (manipulation) from the ECL and ICL models.¹⁵ The relevant alternative hypotheses are

- H3.1: In the presence of the two-step bonus compensation scheme managers will attempt to reach the bonus plateau. This will be achieved by not carrying reserves when appropriate in order to increase reported earnings and realize their bonuses.
- H3.2: In the presence of the Healy bonus compensation scheme managers will attempt to reach the bonus plateau. This will be achieved by not carrying reserves when appropriate in order to increase reported earnings and realize their bonuses.
- H3.3: There will be more earnings management under the Healy scheme than under the two-step scheme.

4. Laboratory Implementation, Empirical Results and Analysis

We recruited participants from the upper divisions and graduate programs of engineering and business in a medium-size North American university. A total of 41 participants took part in the experiment. Of these 41 participants, 21 were randomly assigned to the Two-Step compensation scheme and the other 20 were assigned to the Healy compensation scheme. All participants in both compensation schemes were subjected to the four levels of the within-subjects factor (ICL, ECL I, ECL II, and ECL III), where each level lasts for at least 10 periods.¹⁶ Table 2 presents a summary of the means and standard deviations for profit, desired ending balances, earnings management and the adequacy of desired ending balances.

To properly analyze the data obtained from a mixed-design experiment using a repeated measures ANOVA model, it is necessary to ensure that (in addition to the other customary

¹⁵ In the laboratory environment, earnings management is measured as the difference between the maximum *Fixer* that may be held as a fiscal year ending balance and the actual amount of *Fixer* held as an ending balance.

¹⁶ It took between 80 and 120 minutes for a participant to work through a session (90 minutes was typical and nobody needed more than 120 minutes). The average compensation received by participants was C\$45 (the range was C\$42 to C\$58).

assumptions) the sphericity of the covariance matrix and the homogeneity of variances assumptions are confirmed.¹⁷

The sphericity assumption requires that the variances of the differences between all combinations of related levels of the within-subjects factor “Accounting Rules” (ICL vs. ECL I vs. ECL II vs. ECL III) are equal. We test this assumption using the Mauchly's Test of Sphericity. The results of the tests for each of our four measures (profit, desired ending balances, quantity of earnings management and adequacy) indicates that the chi-squared value for the test applied to each measure exceeds 38.7 and the corresponding p-value is less than 0.001.¹⁸ This suggests that the *F*-statistic obtained from the ANOVA analysis is positively biased, resulting in increasing the likelihood of committing type I error. To overcome this problem, we use the Greenhouse-Geisser correction method applied to the ANOVA.

In addition to the sphericity assumption, we examine the assumption that the error variances for each of the compensation schemes are the same at each level of within-subjects' treatment levels (the Rules).¹⁹ We use the Levene's test of equality of error variances to evaluate the validity of this assumption. The results of these tests support the null hypothesis of equal variances.

After applying the Greenhouse-Geisser correction method to correct for violations of the sphericity assumption, we are able to confirm that the data do not support the null hypotheses that there is no main effect of the Rule variables for any of the variables profit, desired ending balances, quantity of earnings management and adequacy of balances (F-tests, $p < 0.001$ for all

¹⁷ All analyses were done using SPSS. Mauchly's Test of Sphericity, the Greenhouse-Geisser correction and Levene's test of equality of error variances are run through the SPSS repeated measure module.

¹⁸ Specific values are presented in Appendix D, Table 4.1.

¹⁹ Specific values are presented in Appendix D, Table 4.2.

cases). In addition, the data do not support the null hypotheses that there is no main effect of the Compensation variables on any of profit, desired ending balances and quantity of earnings management (F-tests, $p < 0.035$ for all cases). The data maintain the null that the Compensation variables do not have a significant effect on adequacy (F-test, $p = 0.181$).²⁰

In the following four sub-sections we present analyses of the treatment effects of the compensation schemes and the credit loss rules on desired ending balances of *Fixer*, the adequacy of the *Fixer* purchased, the level of earnings management and profit. The effects on the overall level of profit realized by managers and the effect on the distribution of profits over the productivity cycle are evaluated separately. We focus our analysis on the differences between the ICL rule and the ECL II and ECL III rules, which we believe are the most likely interpretations of the way in which the new ECL rule will be implemented in the field.²¹ Additionally, the behavior under the two compensation treatments across the credit loss rules is contrasted with the outcome associated with a simulated long-run profit maximization benchmark.

4.1 Desired Ending Balances

Figure 6 presents mean fiscal year desired ending balances by compensation scheme and credit loss rule over four ten-fiscal-year cycles. Also included in Figure 6 are the baseline values associated with the desired ending balances that would be realized by a manager who is successfully maximizing profits over the productivity cycle.

One of the objectives of replacing the ICL rule with an ECL rule is the restrictions of the ICL rule to provide sufficient flexibility to managers to carry reserves (*Fixer*, in our environment) in the current year to address expected future losses. The results from our laboratory sessions

²⁰ Specific values are presented in Appendix D, Tables 4.3 and 4.4.

²¹ We are excluding ECL I from our analysis because we are using this treatment as a bridge from the ICL rule to the ECL rule. It provides some experience with the ECL rule for our participants. We believe that ECL II and ECL III are more likely to characterize the ECL rule that will ultimately be implemented.

show desired ending balances of *Fixer* increasing as more flexibility is introduced into the definition of the credit loss rule.

Insert Figure 6 About Here

The increases in mean fiscal year desired ending balances from ICL to ECL II and from ICL to ECL III are statistically significant regardless of the management compensation scheme (see Table 3, t-tests, $p < 0.001$ in all cases). However, the increase in mean fiscal year desired ending balances do not increase by as much as they would if the manager was maximizing profit long-run profit. The differences shown in Figure 6 between the desired ending balances in the baseline profit maximizing environment and the environments in the laboratory under the two-step and Healy compensation schemes are significant for both ECL II and ECL III (see Table 4, t-tests, $p < 0.001$ in all cases). In addition, for both ECL II and ECL III the managers under the two-step compensation scheme hold desired ending balances that are significantly greater than those held by managers under the Healy compensation scheme (see Table 4, t-tests, $p < 0.05$ in both cases).

Insert Tables 3 and 4 About Here

The data from the laboratory sessions support the prediction that replacing the ICL rule with an ECL rule comparable to ECL II or ECL III will result in more reserves (*Fixer*) being carried from the current fiscal year to a subsequent year. This is one of the objectives of the rule change.

4.2. Adequacy of *Fixer* Purchased

Figure 7 presents adequacy of the *Fixer* purchased over a ten-fiscal year cycle by compensation scheme and credit loss rule over four ten-fiscal-year cycles. Also included in Figure 7 are the baseline values associated with adequacy of the *Fixer* purchased that would be realized by a manager who is successfully maximizing profits over the productivity cycle.

Insert Figure 7 About Here

The results from our laboratory sessions show the adequacy of the *Fixer* purchased over a productivity cycle increasing as more flexibility is introduced into the definition of the credit loss rule. The increases in mean adequacy from ICL to ECL II and from ICL to ECL III are statistically significant regardless of the management compensation scheme (see Table 5, t-tests, $p < 0.001$ in all cases). However, the increase in mean adequacy does not increase by as much as it would if the manager was maximizing long-run profit. The differences shown in Figure 7 between the adequacy measures in the baseline profit maximizing environment and the environments in the laboratory under the two-step and Healy compensation schemes are significant for both ECL II and ECL III (see Table 6, t-tests, $p < 0.001$ in all cases). In addition, while for both ECL II and ECL III the adequacy measures under the two-step compensation scheme are greater than those held by managers under the Healy compensation scheme, these differences are only significant with the ECL III rule (see Table 6, $p = 0.371$ for ECL II and $p = 0.048$ for ECL III).

The data from the laboratory sessions support the prediction that replacing the ICL rule with an ECL rule comparable to ECL II or ECL III will result in an increase in the adequacy of the

reserves (*Fixer*) purchased over a productivity cycle. This is one of the objectives or the rule change.

Insert Tables 5 and 6 About Here

4.3. Level of Earnings Management

Figure 8 presents the mean fiscal-year quantity of earnings management by compensation scheme and credit loss rule over four ten-fiscal-year cycles. Also included in Figure 8 are the baseline values associated with the earnings management of a manager who is successfully maximizing profit over the productivity cycle.

The results from our laboratory sessions show the mean fiscal-year level of earnings management over a productivity cycle increasing as more flexibility is introduced into the definition of the credit loss rule. The increases in earnings management from ICL to ECL II and from ICL to ECL III are statistically significant regardless of the management compensation scheme (see Table 7, t-tests, $p < 0.001$ in all cases). It is interesting to note that the level of earnings management did not change significantly from ECL I to ECL II regardless of the compensation scheme. The change from ECL I to ECL II was to increase the precision of the forecast for the next fiscal year. The change from ECL II to ECL III was to permit using a forecast for an additional fiscal year into the future and accounting for this information by increasing reserves (*Fixer*) if it was warranted. This introduced substantially more flexibility in the decision to carry *Fixer* into the future and resulted in substantially more earnings management (see Table 7, t-tests for ECL II versus ECL III, $p < 0.001$ for both cases).

Insert Figure 8 About Here

Although there are significant increases in earnings management with the introduction of the ECL rule in place of the ICL rule, for both ECL II and ECL III the level of earnings management under the two-step compensation scheme is significantly less than those under the Healy compensation scheme (see Table 8, $p < 0.05$ for both cases).

Insert Tables 7 and 8 About Here

The data from the laboratory sessions support the prediction that replacing the ICL rule with an ECL rule comparable to ECL II or ECL III will result in earnings management. This did not exist under ICL. This may be a cost associated with the increased flexibility introduced by the ECL rule.

4.4. Profit

4.4.1 Profit over the Productivity Cycle

Figure 9 presents mean fiscal-year profit by compensation scheme and credit loss rule over four ten-fiscal-year cycles. Also included in Figure 9 are the baseline values associated with the profit that would be realized by a manager who is successfully maximizing profits over the productivity cycle.

Insert Figure 9 About Here

The results from our laboratory sessions show the mean fiscal-year profit over a productivity cycle increasing as more flexibility is introduced into the definition of the credit loss rule. The increases in earnings management from ICL to ECL II and from ICL to ECL III are statistically significant regardless of the management compensation scheme (see Table 9, t-tests, $p < 0.001$ in all cases).

It is interesting to note that profit fell from ICL to ECL I regardless of the compensation scheme. This also is seen in the profit from the profit maximization baseline. The recovery with the introduction of ECL II is related to the more precise forecasts for the need for *Fixer* in subsequent fiscal years. Although this did not affect the overall average level of earnings management under the two compensation schemes, the new rule was able to focus the purchase of *Fixer* more accurately to future needs.

The change from ECL I to ECL II was to increase the precision of the forecast for the next fiscal year. The change from ECL II to ECL III was to permit using a forecast for an additional fiscal year into the future and accounting for this information by increasing reserves (*Fixer*) if it was warranted. This introduced substantially more flexibility in the decision to carry *Fixer* into the future and resulted in substantially more earnings management. However, although profit rose from ECL II to ECL III, the increase was only marginally significant for the two-step compensation scheme and not significant for the Healy scheme (see Table 9, t-tests for ECL II versus ECL III, $p = 0.059$ and $p = 0.242$ for the two-step compensation scheme and for the Healy compensation scheme).

Insert Tables 9 and 10 About Here

Although there are significant increases in mean fiscal-year profit with the introduction of the ECL rule in place of the ICL rule, for both ECL II and ECL III the profit under the two-step compensation scheme is greater than those under the Healy compensation scheme with both rules, however this difference is significant only for ECL III (see Table 10, t-test, $p = 0.035$ for ECL III and $p = 0.363$ for ECL II). Under both of the compensation schemes and ECL rules, profit is less than is achieved by a manager who maximizes long-run profit, which is our baseline case (Table 10, t-test, $p < 0.05$ for all cases).

The data from the laboratory sessions support the prediction that replacing the ICL rule with an ECL rule comparable to ECL II or ECL III will result in increased profit. However, the average profit realized in the laboratory environment is less than the baseline profit-maximizing outcome. These differences may be interpreted as the cost associated with the increased flexibility introduced by the ECL rule given the use of the two specific compensation schemes to reward autonomous managers. In our worst-case example, using the Healy compensation scheme, profit increases by nearly 10 percent when ECL III replaces ICL. In the best-case example, profit increases by 15 percent. The cost of the earnings management that is induced by the Healy scheme is approximately one third of the potential gain. The two-step bonus scheme results in a cost of earnings management that slightly more than one tenth of the potential gain (see Appendix D, Table 4.5 which summarizes profit indices).

4.4.2. Profit during High and Low Productivity Periods (Examining the Issue of Procyclicality)

Figure 10 presents the profit from the environment with the baseline ICL rule. The profits are invariant to the compensation scheme. The series presented in Figure 10 reflects the time-series of profit that would be realized over any thirteen decision rounds other than the first decision rounds

in a laboratory session. Because the profit realized by a plant in a fiscal year is based on the output produced at the end of the previous fiscal year, the profit in the first fiscal year of a laboratory session will be zero.

Periods 1 through 7 of a productivity cycle are “good” years. Periods 8 through 10 are “bad” years. However, because of the random occurrence of weather temperature and humidity in the laboratory environment we observe a pattern of good years for profit and bad years for profit that do not confirm precisely with the good and bad productivity years.

Insert Figure 10 About Here

Figure 10 displays what we will identify as “good” years in fiscal years 2 through 6 of a productivity cycle. “Bad” years occur in fiscal years 7 through 10 of the ten-year productivity cycle and in year 1 of the subsequent productivity cycle. As noted above, this specific cyclical performance under ICL is realized regardless of the way managers are compensated.

One of the objectives of the more flexible ECL rule is to permit managers the opportunity to carry enough reserves to offset anticipated probable future losses. Within the context of our laboratory environment, managers are better able to purchase more Fixer under the ECL rule than under the ICL rule and are therefore better able to accommodate probable future losses. Because of this, we will use the mean fiscal year profit for the ICL rule in good years and in bad years as the baseline against which we can judge the effectiveness of the ECL rule. Will profit increase? Will profit be less volatile across the good and bad years? Does it matter if managers are effective profit maximizers or if they manage earnings because of the compensation schemes that are offered to them?

Tables 11 and 12 present summaries of mean profit in good years and bad years for the ICL rule, two baseline environments in which the manager maximizes profits and baseline environments for the two-step and Healy bonus schemes.²² Also presented are coefficients of variation for profit in good and bad years that provide a measure of the dispersion of profit over the good and bad years. Standard deviations are only presented for the mean profit and coefficients of variation corresponding to the laboratory generated data.

Insert Tables 11 and 12 About Here

Replacing the ICL rule with a ECL rule is expected to introduce more flexibility in the use of reserves (*Fixer*) and ultimately smooth out cyclical variation in profit. The ICL profits for good years and bad years are summarized by the good year means and bad year means recorded on Tables 11 and 12. During the bad years mean profit is equal to about 40 percent of the mean profit during the good years. The summary data from the laboratory sessions show that profits under both compensation schemes result in greater profits under ECL II and ECL III than under ICL in both good years and bad years. All of these increases are statistically significant ($p < 0.05$) for all cases except for profits under the Healy scheme with the ECL III rule ($p = 0.133$).

There are no significant reductions in the dispersion of profits over the good and bad years as measured by the coefficients of variation of profits in those periods, except for profits during

²² In the Profit Max Baseline the manager is making decisions to purchase *Fixer* that will maximize profits over the entire productivity cycle and will purchase the maximum amount of *Fixer* permitted to cover potential future needs. Given our definition of managing earnings, this manager does not manage earnings. In the Myopic Profit Max Baseline the manager maximizes profit period-by-period and does consider the need to acquire *Fixer* in the current period to cover potential future needs. This manager will display a substantial amount of earnings management and relatively low overall profit. The numbers upon which Tables 9 and 10 are based are presented in Appendix D, Tables 4.6 and 4.7.

the bad years under the two-step scheme with the ECL III rule ($p > 0.319$ for the former cases and $p = 0.038$ for the latter case).²³

Not only does mean fiscal-year profit increase with the substitution of an ECL rule for an ICL rule but the depth of all in profits in the bad (recession) years is tempered by the ability of managers exercise more discretion in carrying reserves (*Fixer*) to future periods in anticipation of possible losses. However, the reduction of dispersion of profits across the good years and bad years has not generally emerged from the laboratory environment as was anticipated.

5. Summary and Conclusions

The objective of this research is to use the experimental economics methodology to “test bed” the intended and unintended consequences of the mandatory replacement of the ICL model by the ECL model. We do this within the context of a controlled laboratory environment in which we induce incentives consistent with the current ICL model and the proposed ECL model that allows managers to use not only information about the past and current situations of each asset but also expected future public and private information (i.e., allows use of forward looking information).

The results from our test-bedding the credit loss rule change indicates that the replacement of the ICL model with an ECL model that i) drops the requirement that a probable loss implies the likelihood of a loss is at least 70 percent, ii) allows carrying of reserves in recognition of probable losses one year into the future and iii) allows for carrying of reserves to account for expected losses based on historical data leads to managers carrying increased reserves against probable losses. This leads to increased profit in our environment over the economic cycle and a dampening of the downturns in the cycle. Increasing the flexibility of the ECL model by permitting managers to carry reserves based on the likelihood of losses two years into future

²³ All of the t-statistics and p-values for these tests are reported in Appendix D, Table 4.8.

further increases the reserves carried and the ultimate profit. However, the more flexible credit loss rule does induce increased earnings management if managers are not attempting to maximize long-run profit. The choice of a manager compensation scheme has a significant effect on the quantity of earnings management and the realized profit. In our environment the Two-Step Bonus is preferred to than the Healy Bonus (i.e., higher profits and less earnings management). This suggests that the effectiveness of the ECL model relative to the ICL model will be conditional on the manager compensation scheme that is implemented.

Overall, our results show that the implementation of ECL model that allows incorporating forwarding look information can increase the adequacy of estimating expected credit loss allowances and recognize them in a timelier manner. This leads to higher profits over the economic cycle compared to an environment characterized by the ICL model. However, compensation incentives do lead to higher levels of earnings management and dampening of profits relative to the baseline case that maximizes the profits over the economic cycle. With this new policy still in the pre-implementation stage, our results provide ex-ante evidence to policymakers of the advantages of the ECL model as well as about unintended outcomes provided by the incentives inherent in the ECL model. These may warrant issuing supplementary requirements or additional disclosures.²⁴

An implication of our findings is that the standards setters may impose certain limits on the extent to which managers are permitted to use forward-looking information so as to reduce their

²⁴ Although our results and prior literature show, self-interested opportunistic managers may exploit the increased flexibility and discretion allowed in the accounting rule to maximize their periodic compensation through earnings management (Healy 1985; McNichols and Wilson 1988), Watts (2003) argues that conservative accounting standards and norms limit opportunistic behavior induced by self-interested managers. Chen et al. (2007, p. 546) show that “conservatism can have such an effect simply by dampening firm insiders’ incentives to manage earnings.” On the other hand, Jackson and Liu (2010) contend that conservatism may facilitate earnings management. They find that firms manage bad debt expense and allowance for doubtful accounts to meet or beat analysts’ earnings forecasts. McNichols and Wilson (1988) find that firms use provisions for bad debts to manage earnings only when income is extreme. Thus, it is not clear whether in the liberal reporting environment the increased flexibility will lead to a higher degree of conservatism and/or opportunism behavior.

ability to manage earnings. Our findings could be of particular interest to the FASB which is still deliberating its final version of the ECL model. Finally, our findings could have implications on the audit practice. For example, Cohen et al. (2013) find that auditors have greater propensities to constrain aggressive reporting behavior under rules-based standards. Thus, we expect that our findings could be of interest to the auditing standards setters as well.

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Figure 1. Fiscal Years and Production Cycles

Figure 2. Desired Ending Balance of Fixer: Baseline by Rule and Compensation Scheme

**Figure 3. Adequacy of Fixer Purchases:
Baseline by Rule and Compensation Scheme**

**Figure 4. Quantity of Earnings Management:
Baseline by Rules and Compensation Scheme**

Figure 5. Profit: Baseline by Rule and Compensation Scheme

	ICL	ECL I	ECL II	ECL III
Profit 5%	2452	2372	2777	2817
Profit Bonus TS	2452	2372	2768.4	2778.6
Profit Healy	2452	2349	2615	2596

Figure 6. Desired Ending Balances of Fixer

	ICL	ECL I	ECL II	ECL III
Two-Step	108	202	217	314
Healy	108	185	198	258
Profit Max	108	244	260	458

Figure 7. Adequacy

	ICL	ECL I	ECL II	ECL III
Three-Step	0.50	0.56	0.76	0.85
Healy	0.50	0.57	0.73	0.78
Profit Max	0.50	0.64	0.87	1.02

Figure 8. Quantity of Earnings Mangement

	ICL	ECL I	ECL II	ECL III
Three-Step	0	42	39	119
Healy	0	59	56	165
Profit Max	0	0	0	0

Figure 9. Mean Fiscal Year Profit

Figure 10. Per Period Profits: ICL

Table 1. Temperature Conditions, Probability of Low Humidity and <i>Beta</i> Production given the Low Humidity Level in the <i>High and Low Productivity</i> Years																		
	Temperature Conditions																	
	1		2		3		4		5		6		7		8		9	
General	Warm (W)						Mild (M)						Cold (C)					
Specific	W1		W2		W3		M1		M2		M3		C1		C2		C3	
Productivity	β	%	β	%	β	%	β	%	β	%	β	%	β	%	β	%	β	%
High	40	0.1	70	0.2	100	0.3	140	0.4	170	0.5	200	0.6	240	0.7	270	0.8	300	0.9
Low	80	0.1	140	0.2	200	0.3	280	0.4	340	0.5	400	0.6	480	0.7	540	0.8	600	0.9
Notes: β is the quantity of <i>Beta</i> that will be produced if <i>Beta</i> is produced. % is the likelihood that <i>Beta</i> is produced.																		

Table 2. Descriptive Statistics						
Compensation Scheme	Rule		Average Profit	Average Desired Ending Balances	Average Earnings Management	Adequacy Ratio
Two-Step (N=21)	ICL	Mean	2452	108	0	0.50
		StDev	(0.00)	(0.00)	(0.00)	(0.00)
	ECL I	Mean	2378	202	42	0.56
		StDev	(55)	(32)	(32)	(0.06)
	ECL II	Mean	2686	217	39	0.76
		StDev	(101)	(30)	(26)	(0.08)
	ECL III	Mean	2760	314	119	0.85
		StDev	(111)	(79)	(67)	(0.13)
Healy (N=20)	ICL	Mean	2452	108	0	0.50
		StDev	(0)	(0)	(0)	(0.00)
	ECL I	Mean	2364	185	59	0.57
		StDev	(44)	(23)	(23)	(0.05)
	ECL II	Mean	2658	198	56	0.73
		StDev	(93)	(21)	(19)	(0.09)
	ECL III	Mean	2688	258	165	0.78
		StDev	(99)	(62)	(55)	(0.11)

Table 3: Pair-wise comparison for the within-subjects statistics for desired ending balances						
Comparisons	Two-Step			Healy		
	Difference	t-Stat	Sig.	Difference	t-Stat	Sig.
ICL vs. ECL I ECL II ECL III	94	15.35	0.000	77	12.30	0.000
	109	19.22	0.000	90	15.51	0.000
	206	13.27	0.000	150	9.45	0.000
ECL I vs. ECL II ECL III	15	2.97	0.031	13	2.51	0.099
	112	8.51	0.000	73	5.43	0.000
ECL II vs. ECL III	97	8.63	0.000	60	5.22	0.000
Note: Differences are measured as the value for the second level of the accounting rule minus the value of the first level, given a particular compensation scheme.						

Table 4. Between-subjects statistics for mean per period desired ending balances						
Comparisons	ECL II			ECL III		
	Difference	t-Stat	Sig.	Difference	t-Stat	Sig.
Profit Max vs. Two-Step	43	6.655	0.000	144	8.368	0.000
Profit Max vs. Healy	62	12.968	0.000	200	14.493	0.000
Two-Step vs. Healy	19	-2.337	0.025	56	2.522	0.016
Note: Differences are measured as the value for the first compensation scheme minus the value of the second compensation scheme: Two-Step vs. Healy is profit for the Two-Step scheme minus profit for the Healy scheme.						

Table 5. Pair-wise comparison for the within-subjects statistics for adequacy						
Comparisons	Two-Step			Healy		
	Difference	t-Stat	Sig.	Difference	t-Stat	Sig.
ICL vs. ECL I ECL II ECL III	0.067	6.028	0.000	0.073	6.380	0.000
	0.261	14.594	0.000	0.238	12.976	0.000
	0.358	13.581	0.000	0.281	10.406	0.000
ECL I vs. ECL II ECL III	0.193	14.455	0.000	0.164	11.996	0.000
	0.291	12.622	0.000	0.208	8.812	0.000
ECL II vs. ECL III	0.097	5.042	0.000	0.043	2.193	0.206
Note: Differences are measured as the value for the second level of the accounting rule minus the value of the first level, given a particular compensation scheme.						

Table 6. Between-subjects statistics for mean per period adequacy

Comparisons	ECL II			ECL III		
	Difference	t-Stat	Sig.	Difference	t-Stat	Sig.
Profit Max vs. Two-Step	0.11	6.516	0.000	0.17	5.898	0.000
Profit Max vs. Healy	0.14	7.218	0.000	0.24	9.760	0.000
Two-Step vs. Healy	0.03	-0.905	0.371	0.07	2.045	0.048
Note: Differences are measured as the value for the first compensation scheme minus the value of the second compensation scheme: Two-Step vs. Healy is profit for the Two-Step scheme minus profit for the Healy scheme.						

Table 7: Pair-wise comparison for the within-subjects statistics for the quantity of earnings management

Comparisons	Two-Step			Healy		
	Difference	t-Stat	Sig.	Difference	t-Stat	Sig.
ICL vs. ECL I	42	6.957	0.000	59	9.471	0.000
	39	7.728	0.000	56	10.988	0.000
	119	8.831	0.000	165	11.954	0.000
ECL I vs. ECL II	-4	-0.767	1.000	-3	-0.582	1.000
	76	6.702	0.000	105	9.043	0.000
ECL II vs. ECL III	80	8.306	0.000	108	10.971	0.000
Note: Differences are measured as the value for the second level of the accounting rule minus the value of the first level, given a particular compensation scheme.						

Table 8. Between-subjects statistics for mean per period quantity of earnings management

Comparisons	ECL II			ECL III		
	Difference	t-Stat	Sig.	Difference	t-Stat	Sig.
Profit Max vs. Two-Step	-39	-6.843	0.000	-119	-8.073	0.000
Profit Max vs. Healy	-56	-13.037	0.000	-165	-13.424	0.000
Two-Step vs. Healy	-17	2.484	0.017	-46	-2.399	0.021
Note: Differences are measured as the value for the first compensation scheme minus the value of the second compensation scheme: Two-Step vs. Healy is profit for the Two-Step scheme minus profit for the Healy scheme.						

Table 9: Pair-wise comparison for the within-subjects statistics for profit							
			Two-Step			Healy	
Comparisons			Difference	t-Stat	Sig.	Difference	t-Stat Sig.
ICL vs.	ECL I		-74	-6.84	0.000	-88	-7.88 0.000
	ECL II		234	11.03	0.000	206	9.48 0.000
	ECL III		308	13.41	0.000	236	10.04 0.000
ECL I vs.	ECL II		308	12.02	0.000	294	11.18 0.000
	ECL III		382	16.12	0.000	324	13.33 0.000
ECL II vs.	ECL III		74	2.65	0.059	30	1.05 0.242
Note: Differences are measured as the value for the second level of the accounting rule minus the value of the first level, given a particular compensation scheme.							

Table 10. Between-subjects statistics for mean per period profit							
			ECL II			ECL III	
Comparisons			Difference	t-Stat	Sig.	Difference	t-Stat Sig.
Profit Max vs. Two-Step			91	4.212	0.001	57	2.359 0.029
Profit Max vs. Healy			119	5.584	0.000	129	5.845 0.000
Two-Step vs. Healy			28	0.921	0.363	72	2.189 0.035
Note: Differences are measured as the value for the first compensation scheme minus the value of the second compensation scheme: Two-Step vs. Healy is profit for the Two-Step scheme minus profit for the Healy scheme.							

Table 11. Mean fiscal year profit and distribution of profit over good years and bad years during the productivity cycle for ECL II							
	ICL Baseline	Profit Max Baseline	Two-Step Baseline ECL II	Two-Step Actual ECL II	Healy Baseline ECL II	Healy Actual ECL II	Myopic Profit Max Baseline
Mean Profit (St.Dev.)							
Good Yrs	3492.8	3648.0	3648.0	3580.8 (115.69)	3364.0	3529.4 (98.54)	3424.0
Bad Yrs	1411.2	1888.8	1873.2	1787.4 (90.06)	1804.8	1791.2 (178.61)	1600.0
Mean CoV (St.Dev.)							
Good Yrs	0.194	0.155	0.155	0.211 (0.047)	0.270	0.224 (0.051)	0.240
Bad Yrs	0.721	0.651	0.639	0.711 (0.106)	0.932	0.711 (0.094)	0.802
Observations				21		20	
Note: Standard deviations and observations are not applicable for the baseline means.							

Table 12. Mean fiscal year profit and distribution of profit over good years and bad years during the productivity cycle for ECL III							
	ICL Baseline	Profit Max Baseline	Two- Step Baseline ECL III	Two- Step Actual ECL III	Healy Baseline ECL III	Healy Actual ECL III	Myopic Profit Max Baseline
Mean Profit (St.Dev.)							
Good Yrs	3492.8	3552.0	3550.8	3583.8 (139.84)	3245.2	3529.9 (144.61)	3424.0
Bad Yrs	1411.2	2232.0	2023.2	2023.8 (215.65)	1947.6	1890.7 (210.00)	1600.0
Mean CoV (St.Dev.)							
Good Yrs	0.194	0.127	0.127	0.228 (0.118)	0.340	0.242 (0.069)	0.240
Bad Yrs	0.721	0.399	0.558	0.620 (0.246)	0.942	0.758 (0.258)	0.802
Observations				21		20	
Note: Standard deviations and observations are not applicable for the baseline means.							

Appendix A. Instructions for the Healy Compensation Scheme

The following pages are the screen shots for the compensation treatment that uses the Healy Compensation Scheme for managers making decisions for the four Rules: ICL, ECL I, ECL II and ECL III.

Microsoft Edge window titled "Password - Microsoft Edge". The address bar shows the URL "72.69.229.219/research/login.asp".

Username :

Password :

INFORMED CONSENT

Introduction to the study: This session is part of an experiment in the economics of decision making. Various funding organizations have provided resources for this research.

In this session, you will take the role of a plant manager in a hypothetical firm that produces and sells a hypothetical product called Alpha. You will be expected to make decisions throughout the session that will affect the annual profit of your plant as well as your periodic compensation as the plant manager. We will explain this in more detail later in the instructions. The session may last for as many as 120 minutes (2 hours).

How your privacy is protected: Your responses will be kept in an electronic database that includes no personally identifiable information. Any personally identifiable information (e.g., your name) will be replaced in the database with index numbers (e.g., "Participant #86"). Once entered into the database, any record linking your responses to any personally identifiable information will be destroyed. Any presentations of this research will present participants' responses at the aggregate level without personally identifiable information.

Compensation: If you decide to participate, all the money that you will earn during this session will be paid to you in cash at the end of the session. The currency used in this experiment is the Laboratory Dollar (L\$). At the end of the session, your total earnings in Laboratory Dollars will be converted to Canadian Dollars at a rate of L\$130 = C\$1.00. This will be paid to you in cash.

Risks and discomforts: We do not know of any personal risk or discomfort from being in this study. Participation involves making decisions that are ordinary and routine for managers, and there are no known risks (physical or otherwise) beyond those normally encountered in daily life.

Your rights: You should decide on your own whether or not you want to be in this study. Participation in this study is voluntary. If you do decide to be in the study, you have the right to stop being in the study at any time.

Review Board approval: The Institutional Review Board at McMaster University has cleared this study on April 25, 2015. If you have questions about this, please contact McMaster University's IRB at ethicsoffice@mcmaster.ca.

PLEASE READ THE FOLLOWING STATEMENT, FILL OUT YOUR FIRST AND LAST NAME AND CLICK "I Agree to Participate in this Study" BELOW IF YOU AGREE.

I have had the chance to ask any question that I have about this study and the questions have been answered. I have read the information in this consent form and I agree to be in the study.

Please select

First Name:
Last Name:

GENERAL INSTRUCTIONS

You are about to participate in a session that is part of an experiment in the economics of decision making. Several funding organizations have provided resources for this research.

The instructions are simple; if you follow them closely and make careful decisions, you might earn a considerable amount of money. We cannot tell you how much you will make; this amount depends on the decisions that you will make during the session. As researchers, we will learn from your decisions. **This is not an examination; there are no right or wrong answers.**

After the session begins, please do not communicate with other participants. If you have a question at any point in time, please raise your hand and one of the monitors in the room will answer your question privately.

Assigning you an ID:

This software will randomly assign you an ID number (i.e., your experimental identity). Your ID number is private information and hence you should not show it to or share it with any one.

What is your role?

In this session, you will take the role of a plant manager in a hypothetical firm that produces and sells a hypothetical product called Alpha. You will be expected to make decisions throughout the session that will affect the annual profit of your plant as well as your periodic compensation as the plant manager. We will explain this in more detail later in the instructions.

Anonymity and Privacy

In this experiment, your identity and all your decisions are completely anonymous. No one, including the experimenters, will be able to link your decisions to your name.

Monetary Payment of your Payoff

All the money that you will earn during this session will be paid to you privately in cash at the end of the session. The currency used in this experiment is a **Laboratory Dollar (L\$)**. At the end of the session, your total earnings in Laboratory Dollars will be converted to Canadian Dollars at a rate of L\$130 = C\$1.00.

Thank you again for your participation and cooperation.

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SUMMARY OF THE BASIC SETTING

Sun Rise Inc. is a hypothetical firm that produces and sells a hypothetical product called *Alpha* through its several production plants. In this session, you will take the role of the manager for one of these production plants.

To produce *Alpha*, the firm uses special equipment that is purchased and supplied to you by the **central administration** of Sun Rise Inc. The equipment has a useful life of 10 decision rounds and a production capacity of 700 units per round. In the descriptions that follow, each round will be referred to as a "fiscal year" which starts on January 1st and ends on December 31st.

Due to its technical specifications, the productivity of the equipment in producing *Alpha* is higher in the first seven years of its life than the last 3 years of its life (as will be explained shortly). At the end of the 10th year, the firm replaces the old equipment with new identical equipment that will last also for 10 years and has the same production capacity of 700 units per year. This process of replacing the equipment every 10 years will be repeated several times during the session. You will not know how many 10-year cycles you will experience during the course of the session; the session will not run for more than 150 minutes.

As plant manager, on September 1st of each year you will receive **one order** to produce 700 units of *Alpha* for sale and delivery between May and August of the following year. The cost of producing each unit is L\$4. For simplicity, we will ignore all other expenses related to production, selling and administrative expenses. The selling price per unit of *Alpha* is L\$10. Thus, your plant earns revenues each year equal to L\$10 multiplied by the number of *Alpha* units produced.

Although your target is to produce 700 units of *Alpha* each year, the nature of the production process normally yields a number of defective units called *Beta*. The number of *Beta* units that are expected from a batch (an order) of 700 units could vary significantly, depending on two factors: (i) the **age of the equipment** and (ii) the **weather conditions** prevailing during the storage stage of the production process. These two factors will be explained in detail shortly.

Beta units have a market value of L\$0. Consequently, each unit produced of *Beta* will cost your plant L\$4 and will not generate any revenues. Thus, each unit of *Beta* will lower your reported profit by L\$4 while each unit of *Alpha* increases your profit by L\$6. The difference between an *Alpha* and a *Beta* unit is L\$10 in profit. For example, if you received an order for 700 units and all of these were *Alpha* units, your plant would report net profit of **L\$4,200** = [Sales Revenues (700 units of *Alpha* x L\$10) – Production Costs (700 x L\$4)].

If, instead, the output of this order turned out to be 500 units of *Alpha* and 200 units are *Beta*, then your plant would report net profit of **L\$2,200** = [Sales Revenues (500 units of *Alpha* x L\$10) – Costs (700 x L\$4)]. Therefore, 200 units of *Beta* lowered profit by L\$2,000 (L\$10 per unit).

Thus, the higher the number of *Alpha* units your plant produces the higher the profit your plant will report. Sun Rise Inc. is committed to maximize the profit for its shareholders. Therefore, it ties your annual compensation to the net profit that your plant achieves from each order, as will be explained shortly.

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What can you do about these Beta Units?

There exists in the market a product called **Fixer** that is capable of repairing the deficiency in *Beta* units and converting them into *Alpha* units. **Fixer** comes in a spray can. Each can of **Fixer** costs L\$6 and is capable of converting **ONE** unit of *Beta* into an *Alpha* unit, which will be sold at the regular price of L\$10. The conversion process takes place during the final inspection of the output prior to the delivery of the products to customers in stage 3 (May to August).

There are three important features about **Fixer** you need to keep in mind as a plant manager:

1. You can buy **Fixer** only at the end of each fiscal year.
2. Your ability to buy **Fixer** is governed and limited by specific rules that will vary from one setting to another, as will be explained later.
3. The available inventory of cans of **Fixer** never expire and you may return cans of **Fixer** that you carried in inventory from past periods at the end of any fiscal year for a full refund of L\$6 per can.

When can you buy Fixer and how can you use it?

At the end of each year (December 31) you will be given the opportunity to buy cans of **Fixer**. The rules governing these purchases will be explained later. The inventory of **Fixer** available on December 31 of one year will be used to convert *Beta* units that may be produced in subsequent years. The following two scenarios illustrate the impact of buying and using cans of **Fixer** on your plant's annual profit.

Scenario 1:

- Assume that in fiscal year 1 (FY1) your plant produced 700 *Alpha* units. At the end of FY1 your plant purchased 100 cans of **Fixer** for future use.
- Assume further that in fiscal year 2 (FY2) your plant produced 600 units of *Alpha* and 100 units of *Beta*. You also converted the 100 *Beta* units to *Alpha* using the 100 cans of **Fixer** purchased at the end of FY1. At the end of FY2 your plant did not buy any cans of **Fixer**.

Your plant profit for FY1 and FY2 are calculated as follows:

	FY1	FY2
Sales Revenues:	L\$	L\$
(a) From <i>Alpha</i> units @ L\$ 10 per unit	7,000	6,000
(b) From <i>Beta</i> units converted to <i>Alpha</i> @ L\$ 10 per unit	0	1,000
Total Sales Revenues (a + b)	7,000	7,000
Minus Costs:		
(c) Cost of producing 700 units @ L\$ 4 per unit	(2,800)	(2,800)
(d) Cost of Buying cans of Fixer @ L\$ 6 per unit	(600)	(0)
Total costs (c + d)	(3,400)	(2,800)
Net Profit	3,600	4,200

Please note that the **L\$600** spent in **FY1** on buying 100 cans of **Fixer** enabled the company to convert the 100 *Beta* units produced in **FY2** to *Alpha* units and, hence generate more **L\$1,000** in **FY2** than otherwise. Remember that **Fixer** never expires and you can return them for a refund any time in the future.

Scenario 2:

Scenario 2 is IDENTICAL to Scenario 1 in everything EXCEPT that at the end of FY1 your plant **did not buy any cans of Fixer**. The basic information is copied below for your convenience.

- Assume that in fiscal year 1 (FY1) your plant produced 700 *Alpha* units. At the end of FY1 your plant **did not purchase any cans of Fixer** for future use.
- Assume further that in fiscal year 2 (FY2) your plant produced 600 units of *Alpha* and 100 units of *Beta*. You did not convert the 100 Beta units to *Alpha* because you had no cans of *Fixer* available at the end of FY1. At the end of FY2 your plant again did not buy any cans of *Fixer*.

Your plant profit for FY1 and FY2 are calculated as follows:

	FY1	FY2
Sales Revenues:	L\$	L\$
(a) From <i>Alpha</i> units @ L\$ 10 per unit	7,000	6,000
(b) From <i>Beta</i> units converted to <i>Alpha</i> @ L\$ 10 per unit	<u>0</u>	<u>0</u>
Total Sales Revenues (a + b)	7000	6000
Minus Costs:		
(c) Cost of producing 700 units @ L\$ 4 per unit	(2,800)	(2,800)
(d) Cost of Buying cans of Fixer @ L\$ 6 per unit	<u>(0)</u>	<u>(0)</u>
Total costs (c + d)	(2,800)	(2,800)
Net Profit	4,200	3,200

Important Note:

Please note that the sum of total profit for FY1 and FY2 in Scenario 1 is **L\$7,800 (3,600 + 4,200)**, while it is only **L\$7,400 (4,200 + 3,200)**. The L\$400 increase in profit in Scenario 1 resulted from buying 100 cans of Fixer at a cost of L\$600 in FY1 and using them in FY2 to convert 100 units of Beta to Alpha. This resulted in additional revenues of L\$1000 in FY2.

Thus, every can of *Fixer* you purchase will **reduce** your current period reported profit by L\$6. However, when you use it in the subsequent period(s) to convert a Beta unit into Alpha it will generate L\$10, resulting in increasing the overall profit for Sun Rise Inc. by L\$4.

DETAILS OF THE BASIC SETTING

Fiscal Year & Production Cycle

Figure 1 depicts the first 3 fiscal years and first 2 full production cycles of the plant's existence for Setting I. The box inserted into the figure at the 1st production cycle indicates that the plant manager receives the forecast of the weather condition for Stage 2 and must determine net profit and compensation at the end of each fiscal year.

Figure 1. Fiscal Years & Production Cycles

Fiscal Year (FY)

The fiscal year contains 12 months. It starts on January 1st and ends on December 31st. The production cycle also contains 12 months. However, it overlaps with the fiscal year. It starts on September 1st when a new order for 700 units is received and ends on August 31st of the following year after all of the production has been inspected and delivered to the customer. At the end of each fiscal year (December 31st) two events occur: (i) you calculate the annual profit that your production plant generated from the delivery of the product to the customer by the end of August and (ii) you calculate your annual compensation.

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Production Cycle

The production cycle includes the steps required to *produce* and *sell* a batch of 700 units of *Alpha*. It always starts on September 1st of the current fiscal year and ends on August 31st of the next fiscal year. The production cycle is divided into **three 4-month Stages**: the **manufacturing** stage, the **storage** stage and the **inspection & delivery** stage:

- **Stage 1 is the manufacturing stage (September 1st to December 31st):**

- The manufacturing stage starts in the 9th month of a fiscal year (i.e., September 1st) and is completed by the end of December of the fiscal year in which it begins.

- **Stage 2 is the storage stage (January 1st to April 30th):**

- The storage stage begins in the 1st month of the following fiscal year and ends after four months. During this stage the output is stored in special rooms for four months. The **weather conditions** prevailing during storage are an important factor, they will affect the number of Beta units realized from the 700 units.

- **Stage 3 is the inspection, fixing Beta & delivery stage (May 1st to August 31st):**

- During this stage the product is **inspected for quality** and *Alpha* units are identified and delivered to the customer. Units that fail the inspection are defective and are labeled as *Beta* units. *Beta* units can be converted into *Alpha* units if cans of **Fixer** are available. Otherwise, they will be discarded, as they have no market value. This stage completes the production cycle. The plant begins a new production cycle at the beginning the 9th month of the fiscal year with a new order of 700 units.

Quality of the Units Produced

As noted earlier, although the production process is designed to produce *Alpha* units, it normally yields some *Beta* units. The actual number of *Beta* units produced will depend on a combination of **three interrelated factors**: (i) the **age of the equipment**, (ii) the **type of input** used in production and (iii) the **weather condition** prevailing during the storage stage.

(i) Age of the Equipment

The performance of the equipment declines with age. During the first 7 years of its life, the equipment is **highly productive** and yields very high proportions of *Alpha* units. During the last 3 years, however, the equipment becomes less productive and yields higher proportions of *Beta* units than during the first 7 seven years. We will refer to the first 7 years as **High Productivity** years and to the last 3 years as the **Low Productivity** years. At the end of the 10th year, the firm replaces the old equipment with new equipment that will also last for another 10 years with the same productivity characteristics.

Figure 2. Productivity by Age of the Equipment

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(ii) Weather Conditions

In addition to the **equipment age** status (High or Low Productivity), the **weather conditions** prevailing during the storage phase will have an influence on the number of *Beta* units produced. There are two aspects of weather conditions that are particularly critical to the quality of the units produced: (a) the **temperature** and (b) the level of **humidity**. *Beta* units are only produced if the humidity is Low. As the temperature falls the probability of *Beta* units being produced with Low humidity rises.

At the end of each fiscal year you will receive a forecast of the temperature, randomly selected by the computer, from the temperature conditions described in Table 1. This temperature condition will prevail during Stage 2 of the following fiscal year. The associated probability of low humidity will determine whether or not any *Beta* units will be produced and how many will be produced.

Table 1. Temperature Conditions, Probability of Low Humidity and *Beta* Production given the Low Humidity Level in the *High and Low Productivity Years*

PLEASE NOTE THAT YOU DON'T NEED TO RECALL THE DATA INCLUDED IN TABLE 1. TABLE 1 WILL BE AVAILABLE TO YOU WHENEVER YOU NEED IT

	Temperature Conditions																	
	1		2		3		4		5		6		7		8		9	
General	Warm (W)						Mild (M)						Cold (C)					
Specific	W1		W2		W3		M1		M2		M3		C1		C2		C3	
Productivity	β	%	β	%	β	%	β	%	β	%	β	%	β	%	β	%	β	%
High	40	0.1	70	0.2	100	0.3	140	0.4	170	0.5	200	0.6	240	0.7	270	0.8	300	0.9
Low	80	0.1	140	0.2	200	0.3	280	0.4	340	0.5	400	0.6	480	0.7	540	0.8	600	0.9

The follow example illustrates how the weather forecast at the end of a fiscal year can affect the *Beta* realized at the end of Stage 2 in the following fiscal year. Suppose you are at the end of the fourth year of the productivity cycle. Call this fiscal year 4 (FY4). This is a high productivity year. Suppose the computer selects temperature condition 4. You will be told that the temperature condition for FY5 is M1 and that the probability of low humidity is 40%. If the humidity during Stage 2 is low, 140 units of *Beta* will be produced. However, prior to receiving information about the humidity in Stage 2, the expected production of *Beta* is 56 units (40% chance of 140 plus a 60% chance of 0 is 56). At the end of Stage 2 in FY5 the computer will draw a number from the numbers 1 through 10. If the number is 1 through 4 the humidity will be reported as low. If the number is 5 through 10 the humidity will be reported as high. If number 2 is drawn, the humidity is low and you will have produced 140 *Beta* units. Additional descriptive materials about Table 1 are provided on the next screen.

Full Disclosure Note

All of the temperature condition and low or high humidity draws have been made before the session has started. This has been done to standardize the conditions experienced by all participants in all treatments in this experiment.

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Optional Information about Table 1

This section provides detailed explanation about temperature conditions, forecasting weather and determining the actual number of Beta produced each period and how the software running the computer-mediated environment has generated the values for the temperature condition and the actual occurrence of Beta units.

Weather Conditions

As explained earlier, the **weather conditions** prevailing during the storage phase will have an influence on the number of Beta units produced. There are two aspects of weather conditions that are particularly critical to the quality of the units produced: (a) the **temperature** and (b) the **humidity**. Beta units are only produced if the humidity is **Low**. As the temperature falls the probability of Beta units being produced with **Low** humidity rises.

At the end of each fiscal year you will receive a forecast of the temperature, randomly selected by the computer, from the temperature conditions described in Table 1. This temperature condition will prevail during Stage 2 of the following fiscal year. The associated probability of low humidity will determine whether or not any Beta units will be produced and how many will be produced.

Table 1. Temperature Conditions, Probability of Low Humidity and Beta Production given the Low Humidity Level inem> the High and Low Productivity Years

		Temperature Conditions																	
		1		2		3		4		5		6		7		8		9	
General		Warm (W)						Mild (M)						Cold (C)					
Specific		W1		W2		W3		M1		M2		M3		C1		C2		C3	
Productivity		β	%	β	%	β	%	β	%	β	%	β	%	β	%	β	%	β	%
High		40	0.1	70	0.2	100	0.3	140	0.4	170	0.5	200	0.6	240	0.7	270	0.8	300	0.9
Low		80	0.1	140	0.2	200	0.3	280	0.4	340	0.5	400	0.6	480	0.7	540	0.8	600	0.9

(a) Temperature:

There are three possible **General Categories** of temperature: **Warm (W)**, **Mild (M)** and **Cold (C)**. Within each general category of temperature there are three possible sub-categories (states) of temperature labeled as 1, 2 or 3 (higher numbers mean lower temperatures). For example, within the **Warm (W)** general category of temperature there are three states (sub-categories) of W, namely W1, W2 and W3. Similarly, within the **Mild (M)** general category there are three possible states, namely M1, M2 and M3. Finally, within the **Cold (C)** general category there are three possible sub-categories, namely C1, C2 and C3. Therefore, there are 9 different possible specific temperature (states) conditions (W1, W2, W3, M1, M2, M3, C1, C2 and C3). These 9 possibilities are presented in Table 1 and Table 2. Only one of these 9 specific temperature conditions (states) will occur during the storage phase (Stage 2) in a given period.

(b) Humidity:

In addition to the **temperature** conditions (W1, W2 ... C1, C2, C3), the number of Beta units produced is further influenced by the average amount of **humidity** in the air during the storage phase. There are two possible levels of humidity: **High** or **Low**. Beta units are realized **only** under the **Low** humidity condition. If the humidity level prevailed during the storage stage is **HIGH**, then the units produced will be all *Alpha*.

The **combination** of the specific **temperature** condition and the level of **humidity** determine the **final** number of Beta units realized in any particular storage season (stage). Table 1 presents the probability distribution (i.e., the likelihood) of high and low **humidity** and the associated number of Beta units at each given temperature condition during the High productivity years for the equipment. Similar information is presented in Table 2 for the Low productivity years of the equipment.

(c) Forecasting the Weather Conditions

At the end of each fiscal year you receive a forecast about which of the three **General Weather Conditions** (i.e., W, M, or C) will prevail during the storage season (Stage 2). To achieve this goal, the committee uses all available information about the past experiences and the current weather conditions. Historically, each of the three general weather conditions is equally likely to occur. To operationalize the forecast, at the end of each year the computer software will draw at random one number from the numbers 1 through 3. If the number drawn is 1, then the predicted general weather is Warm (W). If the number drawn is 2, then the predicted general weather is Mild (M). If the number drawn is 3, then the predicted general weather is Cold (C).

Although the forecast provides the general weather condition (i.e., W, M or C), it does not inform you about which of the three specific temperature conditions will occur (i.e., W1, W2, W3, M1 ...C3) or what will be the humidity level during Stage 2. Therefore, the most that the end of year forecasting report can present to plant managers is the overall average temperature conditions of the forecasted general condition and the associated average number *Beta* units. To illustrate this point, assume as in the above example that the forecasted general weather condition for next storage season is M. In this case, the forecasting report will show that the average probability of producing *Beta* units for M1, M2 and M3 (see Table 1) is 50% and that the average number of *Beta* units expected if there are any *Beta* units is 170 units. It is important to note that this information is what is listed under M2; the second level of Mild general condition. Thus, the overall probability distribution for each of the three general weather conditions is the second level (i.e., W2 for the Warm general condition, M2 for the Mild general condition and C2 for the Cold general condition).

(d) Determining the Actual Weather Condition

At the start of Stage 3 (May 1st of the next fiscal year) you will find out what the exact humidity level was during Stage 2. This will be determined in two steps.

Step 1: Determine which of the three specific weather conditions within the general weather condition forecasted at the end of December. This will be determined by a random draw by the computer of one number from the numbers 1 through 3. For simplicity, we assume that the three general weather conditions are equally likely to occur.

For example, assume that the general weather condition predicted in December was Mild (M). Assume further that the computer selected number 3. This indicates that the specific weather condition is M3, which has a probability distribution of 40% chance of producing Zero *Beta* units and 60% chance of producing 200 *Beta* units.

Step 2: Determine the actual humidity level occurred during the Stage 2 and the number of *Beta* units produced. This will be determined by a random draw by the computer of one number from the numbers 1 through 10.

To illustrate using the above example in step 1, since the probability of High Humidity for the prevailing temperature condition is 40%, if any number from 1 through 4 is drawn the humidity is revealed as being High and Zero *Beta* units are produced. If, on the other hand, the number drawn is from 5 through 10, the humidity is revealed to be Low and hence 200 units *Beta* units are produced.

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General Comments About the Session

Objective

In this session (experiment) you will have to make purchase decisions about the number of cans of Fixer you will carry over from the end of one fiscal year to the next fiscal year. Only these cans of Fixer may be used to convert any Beta coming from Stage 2 into Alpha units that can be delivered to customers in Stage 3 of the fiscal year. Your plant's profit and your compensation will depend on the purchase decisions that you make. How your compensation is determined is below. The session consists of several Settings. As you move from one Setting to another Setting **ONLY** the rules **governing the purchase** of cans of **Fixer** will be changed.

Your Annual Compensation

Your annual monetary compensation will be calculated as follows:

- You will receive a fixed salary every period of L\$50 given that Net Income is greater than zero but less than L\$2,500.
- If Net Income is between L\$2,500 and L\$4,000, you will receive an additional bonus of 16.5% of the amount above L\$2,500.
- If Net Income is greater than L\$4,000, you will receive a fixed salary of L\$50 plus a lump sum bonus of L\$250.

The following Table provides a schedule that illustrates your annual payoff:

Reported Profit	Fixed Salary	Bonus	Total Compensation per period
If $NI < L\$0$	L\$0	L\$0	L\$0
If $0 < NI \leq L\$2,500$	L\$50	L\$0	L\$50
If $L\$2,501 \leq NI \leq L\$4,000$	L\$50	$0.165 (NI - 2500) = L\$Y$	$L\$50 + L\Y
If $NI > L\$4,000$	L\$50	L\$250	L\$300

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Setting I

The Rule that Governs the Use of Fixer

At the end of Stage 2 of each fiscal year you **MUST** use the available cans of **Fixer** to convert the *Beta* units that emerged from Stage 2 storage. If your inventory of **Fixer** is less than the *Beta* units produced, you must use all of your **Fixer** to convert as many *Beta* units as possible. If you have more **Fixer** than *Beta* units, you may carry cans of Fixer into the next fiscal year unless you choose to return them for the L\$6 refund.

The Rules that Govern Your Purchase or Return of Cans of Fixer

Your decision to purchase cans of Fixer is constrained by the following rules that are imposed by the central management of Sun Rise Inc. on all plant managers:

1. You will be able to purchase cans of **Fixer** if the forecasted probability of low humidity (when *Beta* units are expected to be realized) in the subsequent fiscal year is **at least 70%**.
 - If this condition is satisfied, then you **MUST** purchase enough cans of Fixer to assure that your Desired Ending Balance of Fixer at the end of Stage 1 at least equals the "expected *Beta* units" in the subsequent fiscal year. The "expected *Beta* units" is calculated by multiplying the probability of *Beta* units occurring by the number of *Beta* units that will be produced in low humidity conditions.
 - Your Desired Ending Balance of Fixer at the end of Stage 1 may not exceed the larger of the "expected *Beta* units" or the interim balance of Fixer held at the end of Stage 3.
 - For example, if the probability of low humidity is 80% and the number of *Beta* units that are produced if low humidity is realized is 300 units, you **MUST** carry an inventory of 240 cans (0.80×300) of Fixer into the next fiscal year. If you had 30 cans of Fixer at the start of Stage 1, you **MUST** purchase 210 additional cans before the start of Stage 2. However, if you had 250 cans of Fixer at the start of Stage 1, you may carry the 300 cans into the next fiscal year or you may return up to 10 cans of Fixer and receive a rebate of L\$6 per can.
2. If the probability of low humidity is **less than 70%** you cannot purchase cans of **Fixer** for the subsequent fiscal year, however
 - If you have cans of **Fixer** in inventory that exceed the cans of **Fixer** that you **MUST** hold in inventory for the next fiscal year, you may return some or all of the excess inventory and receive an immediate refund of L\$6 per can of Fixer returned. If you do not return the excess cans of Fixer, these will be carried over to the next fiscal year.

The following two examples demonstrate the application of the above rules.

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Table 1

Practice Examples on Setting I

Example 1: : Hypothetical Scenario for a Fiscal Year when the Probability of Beta for the **Next Fiscal Year is at least 70%.**

Scenario 1:

- Beginning Balance for Fiscal Year 6 = **200 Cans**
- The number of Beta units realized at the end of Stage 2 of Year 6 is **80 units**.
- The Available Interim Balance of Fixer after converting 80 units of Beta is 120 cans.

These numbers will be inserted into the rows on the right side of the **Manager's Purchase Decision Report of Fixer**. See the top right-hand side of the Table below.

- The General Weather Forecast for Fiscal Year 7 that is reported at the end of Fiscal Year 6 is C (see the entry in the left-hand side of the Table below).
- With a General Weather Forecast of C for Fiscal Year 7, the probability of Low Humidity in Fiscal Year 7 will be at least 70%. Therefore it will be possible to purchase Fixer at the end of Fiscal Year 6. The expected number of Beta units ($Ex\beta$) = $80\% \times 270 \beta \text{ units} = 216 \beta \text{ units}$. See the entries in the left-hand side of the Table below.

Decision:

- The Interim Balance of Fixer after converting 80 units of Beta is 120 cans. See these entries on the right-hand side of the Table below.
- Because there is at least a 70% chance of realizing Beta units in Fiscal Year 7 you must carry a balance of Fixer into Fiscal Year 7 that is equal to the expected number of Beta units you may realize in Fiscal Year 7. This is 216 cans of Fixer. See the Expected Beta Units in Fiscal Year 7 entry in the Table below.
- 120 is less than the balance that you **MUST** hold going into Fiscal Year 7. You must enter 216 into the Desired Ending Balance box in the Table below. The computer will automatically calculate your required purchase of 96 cans of Fixer at the end of Fiscal Year 6.

- **Important Note:** The minimum and maximum acceptable Ending Balances are provided at the bottom of the Table below. Also note that when the minimum and maximum values differ you will be able to enter values at these different values and sometimes at values between these two and you will receive information about how the decision you make regarding the choice of ending balances will affect your compensation for the fiscal year and the plant's profit for the fiscal year.

Manager's Purchase Decision Report of Fixer: Setting I

Participant Number> 694072901				Fiscal Year # 6	
Weather Forecast			Fixer Decision for Fiscal Year 6		
Received at the end of Fiscal Year 6			End Balance for Fiscal Year 5		200
Temperature: C			Fiscal Year 6 Use		80
Humidity Level	%	β	Ex β	Interim Balance	
High	0.2	0	0	Your Fiscal Year 6 Decision	
Low	0.8	270	216	Cans Bought	0
				Cans Returned	0
Historical Avg. Expected Beta Units			NA		
Current Expected Beta Units			216 →		
			Desired Ending Balance
			The effect of your decision on profit:
			The effect on your compensation:
<p align="center">Your Decision To Buy or Return Fixer Cans</p> <p align="center">Minimum & Maximum Range of Desired Ending Balance of Fixer</p> <p>A. <u>Minimum</u> Allowable Desired Ending Balance of Fixer = 216</p> <p>B. <u>Maximum</u> Allowable Desired Ending Balance of Fixer = 216</p> <p>Please Select the value in either "A" or "B" above or any amount in that Range and enter in your Desired Ending Balance</p>					

Are you satisfied with the Desired Ending Balance that you entered? ☐ Yes

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Example of the error message received when a participants attempts to enter a value that is outside of the allowable range.

New Page 1 - Microsoft Edge

72.69.229.219/research/HEALY-s2FixerYE1.asp

Table below. Also note that when the minimum and maximum values differ you will be able to enter values at these different values and sometimes at values between these two and you will receive information about how the decision you make regarding the choice of ending balances will affect your compensation for the fiscal year and the plant's profit for the fiscal year.

Manager's Purchase Decision Report of Fixer: Setting I

Participant Number>		Fiscal Year #	
694072901		6	
Weather Forecast			Fixer Decision for Fiscal Year 6
Received at the end of Fiscal Year 6			End Balance for Fiscal Year 5
			200
Temperature: C			Fiscal Year 6 Use
			80
Humidity Level	%	β	Ex β
			Interim Balance
			120
High			
Low			0
			0
Historical Avg. E			
Current Expected Beta Units		216	Desired Ending Balance
			The effect of your decision on profit:
			The effect on your compensation:

Your Decision To Buy or Return Fixer Cans

Minimum & Maximum Range of Desired Ending Balance of Fixer

A. Minimum Allowable Desired Ending Balance of Fixer = 216

B. Maximum Allowable Desired Ending Balance of Fixer = 216

Please Select the value in either "A" or "B" above or any amount in that Range and enter in your Desired Ending Balance

Are you satisfied with the Desired Ending Balance that you entered? ☐ Yes

Next

Example of the error message received if a participant fails to indicate that they are satisfied with the desired ending balance that they entered.

New Page 1 - Microsoft Edge

72.69.229.219/research/HEALY-s2FixerYE1.asp

Table below. Also note that when the minimum and maximum values differ you will be able to enter values at these different values and sometimes at values between these two and you will receive information about how the decision you make regarding the choice of ending balances will affect your compensation for the fiscal year and the plant's profit for the fiscal year.

Manager's Purchase Decision Report of Fixer: Setting I

Participant Number> 694072901		Fiscal Year # 6	
Weather Forecast		Fixer Decision for Fiscal Year 6	
Received at the end of Fiscal Year 6		End Balance for Fiscal Year 5	200
Temperature: C		Fiscal Year 6 Use	80
Humidity Level			120
High			
Low			96
			0
Historical Avg. E			
Current Expected Beta Units	216	The effect of your decision on profit:	216
		The effect on your compensation:	3624
			235

This site says...

Please indicate if you are satisfied with the Desired Ending Balance.

☐ Don't let this page create more messages

OK Cancel

Your Decision To Buy or Return Fixer Cans

Minimum & Maximum Range of Desired Ending Balance of Fixer

A. Minimum Allowable Desired Ending Balance of Fixer = 216

B. Maximum Allowable Desired Ending Balance of Fixer = 216

Please Select the value in either "A" or "B" above or any amount in that Range and enter in your Desired Ending Balance

Are you satisfied with the Desired Ending Balance that you entered? ☐ Yes

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Table 1

Important Note: The amounts on this form are automatically calculated for you. Please check their accuracy.

Equipment Productivity Condition: High Productivity

Manager's Compensation Report: Setting I

Participant Number <input type="text" value="694072901"/>		Fiscal Year # <input type="text" value="6"/>
1	Total Cumulative Manager's Compensation from Previous Fiscal Year	L\$ <input type="text"/>
Profit & Loss Statement For Fiscal Year # <input type="text" value="6"/>		
2	Sales Revenues:	
	(a) # of Alpha units <input type="text" value="620"/> x L\$ 10 = L\$ <input type="text" value="6200"/>	
	(b) From Beta converted to Alpha <input type="text" value="80"/> x L\$ 10 = L\$ <input type="text" value="800"/>	
	(c) From unrepaid Beta units <input type="text" value="0"/> x L\$ 0 = L\$ <input type="text" value="0"/>	L\$ <input type="text" value="7000"/>
	(d) Total Revenues = (a) + (b) + (c) = <input type="text" value="7000"/>	
3	Costs:	
	(a) Production Costs= (700 units x L\$4) = L\$ 2,800	
	(b) Cost of new Fixers purchased (from Weather Forecast and Decision to Buy or Return Fixer) = # of Cans <input type="text" value="96"/> x L\$ 6 = L\$ <input type="text" value="576"/>	(L\$ <input type="text" value="3376"/>
	(c) Refund from Fixer Returned = # of Cans <input type="text" value="0"/> x L\$ 6 = L\$ <input type="text" value="0"/>	
	(d) Total Costs = (a) + (b) - (c) = L\$ <input type="text" value="3376"/>	
4	Net Profit = (Total Revenues – Total Costs)	L\$ <input type="text" value="3624"/>
Manager's Compensation for Fiscal Year # <input type="text" value="6"/>		
5	Fixed Salary	L\$ <input type="text" value="50"/>
6	Bonus:	L\$ <input type="text" value="185.46"/>
7	Total Compensation in Fiscal Year = (lines 5 + 6) =	L\$ <input type="text" value="235.46"/>
8	Manager's Total Cumulative Compensation (lines 1 + 7) <i>Also enter this amount on line (1) of next Fiscal Year's Manager's Compensation Report</i>	L\$ <input type="text" value="235"/>

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Table 1

Practice Examples on Setting I

Example 2: : Hypothetical Scenario for a Fiscal Year when the Probability of Beta for the **Next Fiscal Year is less than 70%.**

Scenario 1:

- Beginning Balance for Fiscal Year 6 = **200 Cans**
- The number of Beta units realized at the end of Stage 2 of Year 6 is **80 units.**
- The Available Interim Balance of Fixer after converting 80 units of Beta is 120 cans.

These numbers will be inserted into the rows on the right side of the **Manager's Purchase Decision Report of Fixer.** See the top right-hand side of the Table below.

- The first three points from Example 1 are unchanged. However, the General Weather Forecast for Fiscal Year 7 that is reported at the end of Fiscal Year 6 is M (see the entry in the left-hand side of the Table below).
- With a General Weather Forecast of M for Fiscal Year 7, the probability of Low Humidity in Fiscal Year 7 will always be less than 70%. Therefore it will be impossible to purchase Fixer at the end of Fiscal Year 6. The expected number of Beta units ($Ex\beta$) = $50\% \times 170 \beta$ units = 85β units. See the entries in the left-hand side of the Table below.

Decision:

- The Interim Balance of Fixer after converting 80 units of Beta is 120 cans. See these entries on the right-hand side of the Table below.
- Because there is less than a 70% chance of realizing Beta units in Fiscal Year 7 you may carry **NO** Fixer into Fiscal Year 7 or you may carry up to all of your interim balance of Fixer into Fiscal Year 7. You may carry any amount between 0 and 120 cans of Fixer into Fiscal Year 7.
- You **MUST** decide how many cans of Fixer you will hold as an Ending Balance at the end of Fiscal Year 6. You must enter any value from 0 to 120 into the Desired Ending Balance box in the Table below. The computer will automatically calculate your required purchase of 96 cans of Fixer at the end of Fiscal Year 6.

- **Important Note:** The minimum and maximum acceptable Ending Balances are provided at the bottom of the Table below. Also note that when the minimum and maximum values differ you will be able to enter values at these different values and sometimes at values between these two and you will receive information about how the decision you make regarding the choice of ending balances will affect your compensation for the fiscal year and the plant's profit for the fiscal year.

Manager's Purchase Decision Report of Fixer: Setting I

Participant Number > 694072901					Fiscal Year # 6	
Weather Forecast				Fixer Decision for Fiscal Year 6		
Received at the end of Fiscal Year 6				End Balance for Fiscal Year 5	200	
Temperature: x				Fiscal Year 6 Use	80	
Humidity Level	%	β	Ex β	Interim Balance	120	
High	0.2	0	0	Your Fiscal Year 6 Decision		
Low	0.8	270	216	Cans Bought	0	
				Cans Returned	0	
Historical Avg. Expected Beta Units			NA			
Current Expected Beta Units			216 →	Desired Ending Balance	<div style="width: 100%; height: 10px; background-color: green;"></div>	
				The effect of your decision on profit:	<div style="width: 100%; height: 10px; background-color: yellow;"></div>	
				The effect on your compensation:	<div style="width: 100%; height: 10px; background-color: yellow;"></div>	
<p style="text-align: center;">Your Decision To Buy or Return Fixer Cans</p> <p style="text-align: center;">Minimum & Maximum Range of Desired Ending Balance of Fixer</p> <p>A. <u>Minimum</u> Allowable Desired Ending Balance of Fixer = 0</p> <p>B. <u>Maximum</u> Allowable Desired Ending Balance of Fixer = 120</p> <p>Please Select the value in either "A" or "B" above or any amount in that Range and enter in your Desired Ending Balance</p>						

Are you satisfied with the Desired Ending Balance that you entered? ☐ Yes

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Table 1

Concluding Comments Before Beginning the Fiscal Year of Setting I

Session I begins in Stage 1 of the first fiscal year (FY1). It is a high productivity year. Because this is the first year in operation, you have sold no units in this fiscal year, but have produced 700 units. The cost of producing these units will be used to determine fiscal year 2 profits. You have received a forecast that the general weather condition for Stage 2 of fiscal year 2 is Warm (W). The overall average of probability distributions and corresponding Beta units are presented as W2 in Table 1 (to refer to information on Table 1 click on the Table 1 tab at the top of this page). You have no net profit from the sale of Alpha in fiscal year 1 and you receive no compensation as a manager in fiscal year 1.

At the end of fiscal year 1 you do not have an opportunity to purchase **Fixer** to convert the Beta units and turn them into Alpha units. However, at the end of year 1 you are provided, at no cost to you, a gift of 100 cans of **Fixer** that you may use to convert future Beta. Note that Fixer cans never expire and hence can be carried forward for future use.

After fiscal year 1 you may have opportunities to purchase **Fixer** or return **Fixer** for a refund of L\$6 for each can of Fixer.

You do not have an opportunity to purchase or return **Fixer** in fiscal year 1.

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Table 1

There is No Decision for You to Take on this Page for this Fiscal Year Only

Equipment Productivity Condition: **High Productivity**

Manager's Purchase Decision Report of Fixer: Setting I

Participant Number <input type="text" value="694072901"/> Fiscal Year # <input type="text" value="1"/>				
Weather Forecast			Fixer Decision for Fiscal Year 1	
Received at the end of Fiscal Year 1			Beginning Balance Fiscal Year 1	<input type="text" value="100"/>
Temperature: M			Fiscal Year 1 Use	<input type="text" value="0"/>
	%	β	Ex β	Interim Balance <input type="text" value="100"/>
High	0.5	0	0	Your Fiscal Year 1 Decision
Low	0.5	170	85	Cans Bought <input type="text" value="0"/>
			Cans Returned	<input type="text" value="0"/>
Historical Avg. Expected Beta Units		N/A		
Current Expected Beta Units		N/A		Desired Ending Balance <input type="text" value="100"/> The effect of your decision on profit: <input type="text"/> The effect on your compensation: <input type="text"/>
<p>Your Decision To Buy or Return Fixer Cans</p> <p>Minimum & Maximum Range of Desired Ending Balance of Fixer</p> <p>A. <u>Minimum</u> Allowable Desired Ending Balance of Fixer = 0</p> <p>B. <u>Maximum</u> Allowable Desired Ending Balance of Fixer = 100</p> <p>Please Select the value in either "A" or "B" above or any amount in that Range and enter in your Desired Ending Balance</p>				

Next

There is no Manager's Compensation Report to complete in Fiscal Year I as no deliveries took place. The Management Compensation Report will be completed starting in Fiscal Year II

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Table 1

Equipment Productivity Condition: **High Productivity**

Manager's Purchase Decision Report of Fixer: Setting I

Actual Beta Produced this Year: 140

Participant Number <input type="text" value="694072901"/> Fiscal Year # <input type="text" value="2"/>				
Weather Forecast			Fixer Decision for Fiscal Year 2	
Received at the end of Fiscal Year 2			End Balance for Fiscal Year 1	<input type="text" value="100"/>
Temperature: W			Fiscal Year 2 Use	<input type="text" value="100"/>
	%	β	Ex β	Interim Balance
High	0.8	0	0	Your Fiscal Year 2 Decision
Low	0.2	70	14	Cans Bought <input type="text" value="0"/>
				Cans Returned <input type="text" value="0"/>
Historical Avg. Expected Beta Units		N/A		
Current Expected Beta Units		N/A		Desired Ending Balance <input type="text"/>
				The effect of your decision on profit: <input type="text"/>
				The effect on your compensation: <input type="text"/>
<p>Your Decision To Buy or Return Fixer Cans</p> <p>Minimum & Maximum Range of Desired Ending Balance of Fixer</p> <p>A. <u>Minimum</u> Allowable Desired Ending Balance of Fixer = <input type="text" value="0"/></p> <p>B. <u>Maximum</u> Allowable Desired Ending Balance of Fixer = <input type="text" value="0"/></p> <p>Please Select the value in either "A" or "B" above or any amount in that Range and enter in your Desired Ending Balance</p>				

Are you satisfied with the Desired Ending Balance that you entered? ☐ Yes

Table 1

Important Note: The amounts on this form are automatically calculated for you. Please check their accuracy.

Equipment Productivity Condition: High Productivity

Manager's Compensation Report: Setting I

Participant Number <input type="text" value="694072901"/>		Fiscal Year # <input type="text" value="2"/>
1	Total Cumulative Manager's Compensation from Previous Fiscal Year	L\$ <input type="text" value="0"/>
Profit & Loss Statement For Fiscal Year # <input type="text" value="2"/>		
	Sales Revenues:	
	(a) # of Alpha units <input type="text" value="560"/> x L\$ 10 = L\$ <input type="text" value="5600"/>	
2	(b) From Beta converted to Alpha <input type="text" value="100"/> x L\$ 10 = L\$ <input type="text" value="1000"/>	
	(c) From unrepaid Beta units <input type="text" value="40"/> x L\$ 0 = L\$ <input type="text" value="0"/>	L\$ <input type="text" value="6600"/>
	(d) Total Revenues = (a) + (b) + (c) = <input type="text" value="6600"/>	
	Costs:	
	(a) Production Costs= (700 units x L\$4) = L\$ 2,800	
	(b) Cost of new Fixers purchased	
	(from Weather Forecast and Decision to Buy or Return Fixer)	
3	= # of Cans <input type="text" value="0"/> x L\$ 6 = L\$ <input type="text" value="0"/>	(L\$ <input type="text" value="2800"/>
	(c) Refund from Fixer Returned	
	= # of Cans <input type="text" value="0"/> x L\$ 6 = L\$ <input type="text" value="0"/>	
	(d) Total Costs = (a) + (b) - (c) = L\$ <input type="text" value="2800"/>	
4	Net Profit = (Total Revenues – Total Costs)	L\$ <input type="text" value="3800"/>
Manager's Compensation for Fiscal Year # <input type="text" value="2"/>		
5	Fixed Salary	L\$ <input type="text" value="50"/>
6	Bonus:	L\$ <input type="text" value="214.5"/>
7	Total Compensation in Fiscal Year = (lines 5 + 6) =	L\$ <input type="text" value="264.5"/>
8	Manager's Total Cumulative Compensation (lines 1 + 7)	L\$ <input type="text" value="265"/>
	Also enter this amount on line (1) of next Fiscal Year's Manager's Compensation Report	

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Setting I continues for 10 fiscal years followed by Setting II.

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Setting II

The session will continue exactly as before with the **exception** that the rules regarding the purchase of **Fixer** have been revised.

Rules that Govern Your Purchase or Return of Cans of Fixer

Your decision to purchase cans of Fixer is constrained by the following rules that are imposed by the central management of Sun Rise Inc. on all plant managers:

1. The 70% rule that restricts you to purchasing Fixer only if the likelihood of low humidity and Beta production occurring in the next fiscal year is at least 70% has been **removed**. You may now purchase cans of Fixer regardless of the probability of *Beta* units occurring in the subsequent fiscal year.
2. You may purchase an amount of **Fixer** to assure that your stock of **Fixer** at the end of Stage 1 is at least equal to the smaller of the following two amounts and at most equals to the larger of the following two amounts:
 - The "expected *Beta* units" based on the information presented in the forecasting report. As before, the "expected *Beta* units" are calculated – as in Setting I- by multiplying the probability of *Beta* units occurring times the number of *Beta* units that will be produced in low humidity conditions.
 - The overall historical average expected *Beta* units for the productivity condition. This value will be provided to you from the historical records of Sun Rise Inc.

For example, suppose the temperature condition is C2 and this is a low productivity year. The probability of low humidity is 80% and if low humidity is realized 540 *Beta* units will be produced. The expected *Beta* units are 432 (0.80×540). The historical average expected *Beta* units are 340. You may purchase cans of **Fixer** that assures that the minimum ending balance of Fixer is 340 cans and the maximum is 432 cans. The desired ending balance, therefore, could be any amount that ranges between 340 and 432. The choice is yours. You may choose the minimum or the maximum or any other number between the two.

3. As in Setting II, if you have cans of **Fixer** in inventory that **exceeds** the cans of **Fixer** that you decided to hold in inventory for the next fiscal year, you may return some or all of the excess inventory and receive \$6 per can of **Fixer** returned.

Information about the **Fixer**, the temperature condition, the humidity level, plant profits and your compensation will be presented on your computer screen in two tables such as the ones on the next page.

Table 1

Practice Examples on Setting II

Example 3: : Hypothetical Scenario for a Fiscal Year when the Probability of Beta for the **Next Fiscal Year is at least 70%.**

Assume the following:

- Beginning Balance for Fiscal Year 6 = **200 Cans**
- The number of Beta units realized at the end of Stage 2 of Year 6 is **80 units**.
- The Available Interim Balance of Fixer after converting 80 units of Beta is **120 cans**.

These numbers will be inserted into the rows on the right side of the **Manager's Purchase Decision Report of Fixer**. See the top right-hand side of the Table below.

- The General Weather Forecast for Fiscal Year 7 that is reported at the end of Fiscal Year 6 is C (see the entry in the left-hand side of the Table below).
- With a General Weather Forecast of C for Fiscal Year 7, the probability of Low Humidity in Fiscal Year 7 will be at least 70%. The expected number of Beta units ($Ex\beta$) = $80\% \times 270 \beta$ units = **216 β units**. See the entries in the left-hand side of the Table below.
- Based on the possible weather conditions that may be realized and the equal likelihood that any one of them may be realized in any year, we can identify the expected production of Beta that can occur when the humidity is low. Because Fiscal Year 7 is a high productivity year, the historical expected Beta production is **170 units**. This value is entered on the left-hand side of the Table below.

Decision:

- The Interim Balance of *Fixer* after converting 80 units of Beta is 120 cans. See these entries on the right-hand side of the Table below.
- You must carry a balance of Fixer into Fiscal Year 7 that is equal to the smaller of the expected number of Beta units you may realize in Fiscal Year 7 (216 units) or to the historical expected Beta production (170 units). See the entries for these two values in the Table below. You may carry a balance that is as large as the largest of these two values or your interim balance of Fixer.
- 120 cans of Fixer is less than the minimum balance that you **MUST** hold going into Fiscal Year 7 (170 cans). You may hold as many as 216 cans. You should enter a value no smaller than 170 and no larger than 216 into the Desired Ending Balance box in the Table below. The computer will automatically calculate your required purchase of cans of Fixer at the end of Fiscal Year 6.

- **Important Note:** The minimum and maximum acceptable Ending Balances are provided at the bottom of the Table below. Also note that when the minimum and maximum values differ you will be able to enter values at these different values and sometimes at values between these two and you will receive information about how the decision you make regarding the choice of ending balances will affect your compensation for the fiscal year and the plant's profit for the fiscal year.

Another Important Note: You may find it helpful to enter different values for your Desired Ending Balance when you have a choice over the balance you select before you click on the "NEXT" button below the Manager's Purchase Decision Report Table. As you change your selection you will see how your compensation changes and how the plant's profits change. Once you decide on the Desired Ending Balance that is best for you, then you should click the "NEXT" button to move on to the next screen.

Manager's Purchase Decision Report of Fixer: Setting II

Participant Number > 694072901 Fiscal Year # 6				
Weather Forecast			Fixer Decision for Fiscal Year 6	
Received at the end of Fiscal Year 6			End Balance for Fiscal Year 5	200
Temperature: x			Fiscal Year 6 Use	80
Humidity Level	%	β	Ex β	Interim Balance
High	0.5	0	0	Your Fiscal Year 6 Decision
Low	0.5	170	85	Cans Bought (B)
				Cans Returned (R)
Historical Avg. Expected Beta Units		170		
Current Expected Beta Units		85	Desired Ending Balance	
			The effect of your decision on profit:	
			The effect on your compensation:	
<p align="center">Your Decision To Buy or Return Fixer Cans</p> <p align="center"><u>Minimum & Maximum Range of Desired Ending Balance of Fixer</u></p> <p>A. <u>Minimum</u> Allowable Desired Ending Balance of Fixer = 170</p> <p>B. <u>Maximum</u> Allowable Desired Ending Balance of Fixer = 216</p> <p>Please Select the value in either "A" or "B" above or any amount in that Range and enter in your Desired Ending Balance</p>				

Are you satisfied with the Desired Ending Balance that you entered? ☐ Yes

Next

Table 1

Practice Examples on Setting II

Example 4: : Hypothetical Scenario for a Fiscal Year when the Probability of Beta for the **Next Fiscal Year is less than 70%.**

Assume the following:

- Beginning Balance for Fiscal Year 6 = **200 Cans**
- The number of Beta units realized at the end of Stage 2 of Year 6 is **80 units**.
- The Available Interim Balance of Fixer after converting 80 units of Beta is **120 cans**.

These numbers will be inserted into the rows on the right side of the **Manager's Purchase Decision Report of Fixer**. See the top right-hand side of the Table below.

- The first three points from Example 1 are unchanged. However, the General Weather Forecast for Fiscal Year 7 that is reported at the end of Fiscal Year 6 is M (see the entry in the left-hand side of the Table below).
- With a General Weather Forecast of M for Fiscal Year 7, the probability of Low Humidity in Fiscal Year 7 will always be less than 70%. The expected number of Beta units ($Ex\beta$) = $50\% \times 170 \beta$ units = **85 β units**. See the entries in the left-hand side of the Table below.
- Based on the possible weather conditions that may be realized and the equal likelihood that any one of them may be realized in any year, we can identify the expected production of Beta that can occur when the humidity is low. Because Fiscal Year 7 is a high productivity year, the historical expected Beta production is **170 units**. This value is entered on the left-hand side of the Table below.

Decision:

- The Interim Balance of *Fixer* after converting 80 units of Beta is 120 cans. See these entries on the right-hand side of the Table below.
- You must carry a balance of Fixer into Fiscal Year 7 that is equal to the smaller of the expected number of Beta units you may realize in Fiscal Year 7 (85 units) or to the historical expected Beta production (170 units). See the entries for these two values in the Table below. You may carry a balance that is as large as the largest of these two values or your interim balance of Fixer.
- You MUST decide how many cans of Fixer you will hold as an Ending Balance at the end of Fiscal Year 6. You must enter any value from 85 to 170 into the Desired Ending Balance box in the Table below. The computer will automatically calculate your required purchase or refund of cans of Fixer at the end of Fiscal Year 6.

- **Important Note:** The minimum and maximum acceptable Ending Balances are provided at the bottom of the Table below. Also note that when the minimum and maximum values differ you will be able to enter values at these different values and sometimes at values between these two and you will receive information about how the decision you make regarding the choice of ending balances will affect your compensation for the fiscal year and the plant's profit for the fiscal year.

Another Important Note: You may find it helpful to enter different values for your Desired Ending Balance when you have a choice over the balance you select before you click on the "NEXT" button below the Manager's Purchase Decision Report Table. As you change your selection you will see how your compensation changes and how the plant's profits change. Once you decide on the Desired Ending Balance that is best for you, then you should click the "NEXT" button to move on to the next screen.

Manager's Purchase Decision Report of Fixer: Setting II

Participant Number > 694072901					Fiscal Year # 6	
Weather Forecast				Fixer Decision for Fiscal Year 6		
Received at the end of Fiscal Year 6				End Balance for Fiscal Year 5	200	
Temperature: M				Fiscal Year 6 Use	80	
Humidity Level	%	β	Ex β	Interim Balance	120	
High	0.5	0	0	Your Fiscal Year 6 Decision		
Low	0.5	170	85	Cans Bought (B)	0	
				Cans Returned	0	
Historical Avg. Expected Beta Units			170			
Current Expected Beta Units			85	Desired Ending Balance	<div style="width: 100%; height: 10px; background-color: green;"></div>	
				The effect of your decision on profit:	<div style="width: 100%; height: 10px; background-color: yellow;"></div>	
				The effect on your compensation:	<div style="width: 100%; height: 10px; background-color: yellow;"></div>	
<p align="center">Your Decision To Buy or Return Fixer Cans</p> <p align="center">Minimum & Maximum Range of Desired Ending Balance of Fixer</p> <p>A. <u>Minimum</u> Allowable Desired Ending Balance of Fixer = 85</p> <p>B. <u>Maximum</u> Allowable Desired Ending Balance of Fixer = 170</p> <p>Please Select the value in either "A" or "B" above or any amount in that Range and enter in your Desired Ending Balance</p>						

Are you satisfied with the Desired Ending Balance that you entered? ☐ Yes

You will now participate in decision rounds of Setting II

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Table 1

Equipment Productivity Condition: **High Productivity**

Manager's Purchase Decision Report of Fixer: Setting II

Actual Beta Produced this Year: 400

Participant Number <input type="text" value="694072901"/>					Fiscal Year # <input type="text" value="11"/>	
Weather Forecast				Fixer Decision for Fiscal Year 11		
Received at the end of Fiscal Year 11				End Balance for Fiscal Year 10	<input type="text" value="0"/>	
Temperature: M				Fiscal Year 11 Use	<input type="text" value="0"/>	
	%	β	Ex β	Interim Balance	<input type="text" value="0"/>	
High	0.5	0	0	Your Fiscal Year 11 Decision		
Low	0.5	170	85	Cans Bought	<input type="text" value="0"/>	
				Cans Returned	<input type="text" value="0"/>	
Historical Avg. Expected Beta Units			170			
Current Expected Beta Units			85	Desired Ending Balance The effect of your decision on profit: The effect on your compensation:		
<p>Your Decision To Buy or Return Fixer Cans</p> <p>Minimum & Maximum Range of Desired Ending Balance of Fixer</p> <p>A. <u>Minimum</u> Allowable Desired Ending Balance of Fixer = 85</p> <p>B. <u>Maximum</u> Allowable Desired Ending Balance of Fixer = 170</p> <p>Please Select the value in either "A" or "B" above or any amount in that Range and enter in your Desired Ending Balance</p>						

Are you satisfied with the Desired Ending Balance that you entered? ☐ Yes

Table 1

Important Note: The amounts on this form are automatically calculated for you. Please check their accuracy.

Equipment Productivity Condition: High Productivity

Manager's Compensation Report: Setting II

Participant Number <input type="text" value="694072901"/>		Fiscal Year # <input type="text" value="11"/>
1	Total Cumulative Manager's Compensation from Previous Fiscal Year	L\$ <input type="text" value="1377"/>
Profit & Loss Statement For Fiscal Year # <input type="text" value="11"/>		
2	Sales Revenues:	
	(a) # of Alpha units <input type="text" value="300"/> x L\$ 10 = L\$ <input type="text" value="3000"/>	
	(b) From Beta converted to Alpha <input type="text" value="0"/> x L\$ 10 = L\$ <input type="text" value="0"/>	
	(c) From unrepaid Beta units <input type="text" value="400"/> x L\$ 0 = L\$ <input type="text" value="0"/>	
	(d) Total Revenues = (a) + (b) + (c) = <input type="text" value="3000"/>	
3	Costs:	
	(a) Production Costs= (700 units x L\$4) = L\$ 2,800	
	(b) Cost of new Fixers purchased (from Weather Forecast and Decision to Buy or Return Fixer)	
	= # of Cans <input type="text" value="85"/> x L\$ 6 = L\$ <input type="text" value="510"/>	
	(c) Refund from Fixer Returned = # of Cans <input type="text" value="0"/> x L\$ 6 = L\$ <input type="text" value="0"/>	
(d) Total Costs = (a) + (b) - (c) = L\$ <input type="text" value="3310"/>		(L\$ <input type="text" value="3310"/>
4	Net Profit = (Total Revenues – Total Costs)	L\$ <input type="text" value="310"/>
Manager's Compensation for Fiscal Year # <input type="text" value="11"/>		
5	Fixed Salary	L\$ <input type="text" value="50"/>
6	Bonus:	L\$ <input type="text" value="0"/>
7	Total Compensation in Fiscal Year = (lines 5 + 6) =	L\$ <input type="text" value="50"/>
8	Manager's Total Cumulative Compensation (lines 1 + 7) Also enter this amount on line (1) of next Fiscal Year's Manager's Compensation Report	L\$ <input type="text" value="1427"/>

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Setting II continues for 10 fiscal years followed by Setting III.

Table 1

Practice Examples on Setting III

Example 3: : Hypothetical Scenario for a Fiscal Year when the Probability of Beta for the **Next Fiscal Year is at least 70%.**

Assume the following:

- Beginning Balance for Fiscal Year 6 = **200 Cans**
- The number of Beta units realized at the end of Stage 2 of Year 6 is **80 units**.
- The Available Interim Balance of Fixer after converting 80 units of Beta is **120 cans**.

These numbers will be inserted into the rows on the right side of the **Manager's Purchase Decision Report of Fixer**. See the top right-hand side of the Table below.

- The General Weather Forecast for Fiscal Year 7 that is reported at the end of Fiscal Year 6 is C (see the entry in the left-hand side of the Table below).
- With a General Weather Forecast of C for Fiscal Year 7, the probability of Low Humidity in Fiscal Year 7 will be at least 70%. The expected number of Beta units ($Ex\beta$) = $80\% \times 270 \beta$ units = **216 β units**. See the entries in the left-hand side of the Table below.
- Based on the possible weather conditions that may be realized and the equal likelihood that any one of them may be realized in any year, we can identify the expected production of Beta that can occur when the humidity is low. Because Fiscal Year 7 is a high productivity year, the historical expected Beta production is **170 units**. This value is entered on the left-hand side of the Table below.

Decision:

- The Interim Balance of *Fixer* after converting 80 units of Beta is 120 cans. See these entries on the right-hand side of the Table below.
- You must carry a balance of Fixer into Fiscal Year 7 that is equal to the smaller of the expected number of Beta units you may realize in Fiscal Year 7 (216 units) or to the historical expected Beta production (170 units). See the entries for these two values in the Table below. You may carry a balance that is as large as the largest of these two values or your interim balance of Fixer.
- 120 cans of Fixer is less than the minimum balance that you **MUST** hold going into Fiscal Year 7 (170 cans). You may hold as many as 216 cans. You should enter a value no smaller than 170 and no larger than 216 into the Desired Ending Balance box in the Table below. The computer will automatically calculate your required purchase of cans of Fixer at the end of Fiscal Year 6.

- **Important Note:** The minimum and maximum acceptable Ending Balances are provided at the bottom of the Table below. Also note that when the minimum and maximum values differ you will be able to enter values at these different values and sometimes at values between these two and you will receive information about how the decision you make regarding the choice of ending balances will affect your compensation for the fiscal year and the plant's profit for the fiscal year.

Another Important Note: You may find it helpful to enter different values for your Desired Ending Balance when you have a choice over the balance you select before you click on the "NEXT" button below the Manager's Purchase Decision Report Table. As you change your selection you will see how your compensation changes and how the plant's profits change. Once you decide on the Desired Ending Balance that is best for you, then you should click the "NEXT" button to move on to the next screen.

Manager's Purchase Decision Report of Fixer: Setting III

Participant Number> 694072901					Fiscal Year # 6	
Weather Forecast				Fixer Decision for Fiscal Year 6		
Received at the end of Fiscal Year 6				End Balance for Fiscal Year 5	200	
Temperature: x				Fiscal Year 6 Use	80	
Humidity Level	%	β	Ex β	Interim Balance	120	
High	0.5	0	0	Your Fiscal Year 6 Decision		
Low	0.5	170	85	Cans Bought (B)	0	
				Cans Returned (R)	0	
Historical Avg. Expected Beta Units			170			
Current Expected Beta Units			85	Desired Ending Balance	<input type="text"/>	
				The effect of your decision on profit:	<input type="text"/>	
				The effect on your compensation:	<input type="text"/>	
<p align="center">Your Decision To Buy or Return Fixer Cans</p> <p align="center">Minimum & Maximum Range of Desired Ending Balance of Fixer</p> <p>A. <u>Minimum</u> Allowable Desired Ending Balance of Fixer = 56</p> <p>B. <u>Maximum</u> Allowable Desired Ending Balance of Fixer = 170</p> <p>Please Select the value in either "A" or "B" above or any amount in that Range and enter in your Desired Ending Balance</p>						

Are you satisfied with the Desired Ending Balance that you entered? ☐ Yes

Next

You will now participate in decision rounds of Setting III

Table 1

Equipment Productivity Condition: **High Productivity**

Manager's Purchase Decision Report of Fixer: Setting III

Actual Beta Produced this Year: 400

Participant Number <input type="text" value="694072901"/> Fiscal Year # <input type="text" value="21"/>				
Weather Forecast			Fixer Decision for Fiscal Year 21	
Received at the end of Fiscal Year 21			End Balance for Fiscal Year 20	<input type="text" value="170"/>
Temperature: M1			Fiscal Year 21 Use	<input type="text" value="170"/>
	%	β	Ex β	Interim Balance
High	0.6	0	0	Your Fiscal Year 21 Decision
Low	0.4	140	56	Cans Bought
				Cans Returned
Historical Avg. Expected Beta Units			170	
Current Expected Beta Units			56	Desired Ending Balance
				<input type="text" value=""/>
				The effect of your decision on profit:
				<input type="text" value=""/>
				The effect on your compensation:
				<input type="text" value=""/>

Your Decision To Buy or Return Fixer Cans

Minimum & Maximum Range of Desired Ending Balance of Fixer

A. Minimum Allowable Desired Ending Balance of Fixer =

B. Maximum Allowable Desired Ending Balance of Fixer =

Please Select the value in either "A" or "B" above or any amount in that Range and enter in your Desired Ending Balance

Are you satisfied with the Desired Ending Balance that you entered? ☐ Yes

Table 1

Important Note: The amounts on this form are automatically calculated for you. Please check their accuracy.

Equipment Productivity Condition: High Productivity

Manager's Compensation Report: Setting III

Participant Number <input type="text" value="694072901"/>		Fiscal Year # <input type="text" value="21"/>
1	Total Cumulative Manager's Compensation from Previous Fiscal Year	L\$ <input type="text" value="2756"/>
Profit & Loss Statement For Fiscal Year # <input type="text" value="21"/>		
2	Sales Revenues: (a) # of Alpha units <input type="text" value="300"/> x L\$ 10 = L\$ <input type="text" value="3000"/> (b) From Beta converted to Alpha <input type="text" value="170"/> x L\$ 10 = L\$ <input type="text" value="1700"/> (c) From unrepaired Beta units <input type="text" value="230"/> x L\$ 0 = L\$ <input type="text" value="0"/> (d) Total Revenues = (a) + (b) + (c) = <input type="text" value="4700"/>	L\$ <input type="text" value="4700"/>
3	Costs: (a) Production Costs= (700 units x L\$4) = L\$ 2,800 (b) Cost of new Fixers purchased (from Weather Forecast and Decision to Buy or Return Fixer) = # of Cans <input type="text" value="56"/> x L\$ 6 = L\$ <input type="text" value="336"/> (c) Refund from Fixer Returned = # of Cans <input type="text" value="0"/> x L\$ 6 = L\$ <input type="text" value="0"/> (d) Total Costs = (a) + (b) - (c) = L\$ <input type="text" value="3136"/>	(L\$ <input type="text" value="3136"/>
4	Net Profit = (Total Revenues – Total Costs)	L\$ <input type="text" value="1564"/>
Manager's Compensation for Fiscal Year # <input type="text" value="21"/>		
5	Fixed Salary	L\$ <input type="text" value="50"/>
6	Bonus:	L\$ <input type="text" value="0"/>
7	Total Compensation in Fiscal Year = (lines 5 + 6) =	L\$ <input type="text" value="50"/>
8	Manager's Total Cumulative Compensation (lines 1 + 7) <i>Also enter this amount on line (1) of next Fiscal Year's Manager's Compensation Report</i>	L\$ <input type="text" value="2806"/>

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Setting III continues for 10 fiscal years followed by Setting IV.

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Setting IV

The session will continue exactly as before with the **exception** that the information you will receive from weather forecast reports has been expanded AND the rules regarding the purchase of **Fixer** have been revised. Sun Rise Inc. has upgraded the forecasting equipment so that it is now capable of predicting the specific weather conditions for TWO consecutive production cycles.

Weather Forecast Reports

You will continue receiving the weather forecast reports of the temperature condition for Stage 2 of the upcoming production cycle as you have in Setting III. In addition, you will receive the forecast for the general temperature condition for the following production cycle. In other words, at the end of each fiscal year t you will receive two sets of weather forecast probability distributions of temperature conditions: the specific temperature condition for Stage 2 of the current production year (fiscal year $t+1$) and for Stage 2 of the following fiscal year in the production cycle (fiscal year $t+2$). You may wish to take this information into account when you make your annual purchase decision of Fixer cans.

Rules that Govern Your Purchase or Return of Cans of Fixer

You can purchase an amount of Fixer to assure that your stock of Fixer at the end of Stage 1 is at least equal to the smallest of the following three amounts and at most equal to the largest of the following three amounts:

- The "expected *Beta* units" based on the forecasted **specific** weather condition for the upcoming storage season.
- The "expected *Beta* units" based on the forecasted **general** weather condition in the next year's storage season.
- The overall historical average expected *Beta* units for the *productivity* condition. This value will be provided to you from the historical records of Sun Rise Inc.

The rules that govern your purchase or return of cans of Fixer are the same as before.

Please note the following:

- At the end of next fiscal year, you will again receive weather forecast reports for two years: an updated **specific** forecast for upcoming storage season (previously you received a general forecast for this storage season) and a second forecast for the general weather condition for following year's storage season.
- The updated **specific** forecast for upcoming storage season is one of the three states of last year's forecasted **general** weather condition. For example, if last year's forecasted general condition was C, then the updated specific weather condition this year will be one of three possibilities (C1, C2 or C3) with one-third probability for each.

Example

Suppose that you are at the end of fiscal year 8 (a low productivity year) and that the temperature conditions for the next two storage seasons are first M3 for the immediate Stage 2 and then C for the following year's Stage 2. The probability of low humidity is 60% with M3 and 80% with C. If low humidity is realized in each year, 400 Beta units will be produced in the first year with certainty and it is expected that 540 Beta units will be produced with an 80% probability in the second year. The expected Beta units are **240** (0.60×400) in the first year and **432** (0.80×540) in the second. The historical average expected Beta units are **340**.

The desired ending balance, therefore, could be any amount that ranges between 240 and 432. The choice is yours. You may choose the minimum or the maximum or any other number between the two.

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Table 1

Equipment Productivity Condition: **High Productivity**

Manager's Purchase Decision Report of Fixer: Setting IV

Actual Beta Produced this Year: 400

Participant Number <input type="text" value="694072901"/> Fiscal Year # <input type="text" value="31"/>									
Fiscal Year 31			Fiscal Year 32			Fixer Decision for Fiscal Year 31			
Specific Temperature Condition: M1			General Temperature Condition: W			End Balance for Fiscal Year 30		<input type="text" value="204"/>	
						Fiscal Year 31 Use		<input type="text" value="204"/>	
	%	β	Ex β	%	β	Ex β	Interim Balance		<input type="text" value="0"/>
High	0.6	0	0	0.8	0	0	Your Fiscal Year 31 Decision		
Low	0.4	140	56	0.2	70	14	Cans Bought		<input type="text" value="0"/>
							Cans Returned		<input type="text" value="0"/>
Historical Avg. Expected Beta Units					170				
Current Expected Beta Units					56		Desired Ending Balance		<input type="text" value=""/>
							The effect of your decision on profit:		<input type="text" value=""/>
							The effect on your compensation:		<input type="text" value=""/>
<p align="center">Your Decision To Buy or Return Fixer Cans</p> <p align="center">Minimum & Maximum Range of Desired Ending Balance of Fixer</p> <p>A. <u>Minimum</u> Allowable Desired Ending Balance of Fixer = <input type="text" value="56"/></p> <p>B. <u>Maximum</u> Allowable Desired Ending Balance of Fixer = <input type="text" value="184"/></p> <p>Please Select the value in either "A" or "B" above or any amount in that Range and enter in your Desired Ending Balance</p>									

Are you satisfied with the Desired Ending Balance that you entered? ☐ Yes

Table 1

Important Note: The amounts on this form are automatically calculated for you. Please check their accuracy.

Equipment Productivity Condition: High Productivity

Manager's Compensation Report: Setting IV

Participant Number <input type="text" value="694072901"/>		Fiscal Year # <input type="text" value="31"/>
1	Total Cumulative Manager's Compensation from Previous Fiscal Year	L\$ <input type="text" value="4112"/>
Profit & Loss Statement For Fiscal Year # <input type="text" value="31"/>		
Sales Revenues:		
2	(a) # of Alpha units <input type="text" value="300"/> x L\$ 10 = L\$ <input type="text" value="3000"/>	L\$ <input type="text" value="5040"/>
	(b) From Beta converted to Alpha <input type="text" value="204"/> x L\$ 10 = L\$ <input type="text" value="2040"/>	
	(c) From unrepaired Beta units <input type="text" value="196"/> x L\$ 0 = L\$ <input type="text" value="0"/>	
	(d) Total Revenues = (a) + (b) + (c) = <input type="text" value="5040"/>	
Costs:		
3	(a) Production Costs= (700 units x L\$4) = L\$ 2,800	(L\$ <input type="text" value="3136"/>
	(b) Cost of new Fixers purchased (from Weather Forecast and Decision to Buy or Return Fixer) = # of Cans <input type="text" value="56"/> x L\$ 6 = L\$ <input type="text" value="336"/>	
	(c) Refund from Fixer Returned = # of Cans <input type="text" value="0"/> x L\$ 6 = L\$ <input type="text" value="0"/>	
	(d) Total Costs = (a) + (b) - (c) = L\$ <input type="text" value="3136"/>	
4	Net Profit = (Total Revenues – Total Costs)	L\$ <input type="text" value="1904"/>
Manager's Compensation for Fiscal Year # <input type="text" value="31"/>		
5	Fixed Salary	L\$ <input type="text" value="50"/>
6	Bonus:	L\$ <input type="text" value="0"/>
7	Total Compensation in Fiscal Year = (lines 5 + 6) =	L\$ <input type="text" value="50"/>
8	Manager's Total Cumulative Compensation (lines 1 + 7) Also enter this amount on line (1) of next Fiscal Year's Manager's Compensation Report	L\$ <input type="text" value="4162"/>

Next

Setting IV continues for 14 fiscal years followed by the following thank you message.

Appendix B. Section 3 Tables

Table 3.1. Weather Forecasts and Related Information by Fiscal Year within a 10-Year Cycle for ICL and ECL I (from Fiscal Year 2 of one Cycle through Fiscal Year 1 of the Next Cycle)								
	Reported to Manager at the End of Stage 1 of the Fiscal Year				Basis of Beta Production at the End of Stage 2 of the Fiscal Year			
Fiscal Year	General Weather	Mean Likelihood of <i>Beta</i> given General Weather	Mean <i>Beta</i> given General Weather	Fiscal Year	Specific Weather	Likelihood of <i>Beta</i>	Max Possible <i>Beta</i>	Actual <i>Beta</i> based on draw
1	M	0.5	170					
2	W	0.2	70	2	M1	0.4	140	140
3	W	0.2	70	3	W1	0.1	40	0
4	C	0.8	270	4	W2	0.2	70	0
5	M	0.5	170	5	C3	0.9	300	300
6	M	0.5	170	6	M1	0.4	140	0
7	W	0.2	70	7	M3	0.6	200	200
8	C	0.8	540	8	W3	0.3	200	0
9	C	0.8	540	9	C2	0.8	540	540
10	M	0.5	340	10	C3	0.9	600	600
				1	M3	0.6	400	400
Note: The general weather forecast is drawn at the end of the fiscal year before the year to which it applies. The specific weather is the realization of the general weather forecast in the fiscal year following announcement of the general forecast.								

Table 3.2. Weather Forecasts and Related Information by Fiscal Year within a 10-Year Cycle for ECL II (from Fiscal Year 2 of one Cycle through Fiscal Year 1 of the Next Cycle)

Reported to Manager at the End of Stage 1 of the Fiscal Year				Basis of Beta Production at the End of Stage 2 of the Fiscal Year				
Fiscal Year	Specific Weather after Stage 2 of the Next Fiscal Year	Likelihood of <i>Beta</i> in the Next Fiscal Year	Max Possible <i>Beta</i> in the Next Fiscal Year	Fiscal Year	Specific Weather	Likelihood of <i>Beta</i>	Max Possible <i>Beta</i>	Actual <i>Beta</i> based on draw
1	M1	0.4	140					
2	W1	0.1	40	2	M1	0.4	140	140
3	W2	0.2	70	3	W1	0.1	40	0
4	C3	0.9	300	4	W2	0.2	70	0
5	M1	0.4	140	5	C3	0.9	300	300
6	M3	0.6	200	6	M1	0.4	140	0
7	W3	0.3	200	7	M3	0.6	200	200
8	C2	0.8	540	8	W3	0.3	200	0
9	C3	0.9	600	9	C2	0.8	540	540
10	M3	0.6	400	10	C3	0.9	600	600
				1	M3	0.6	400	400

Note: The specific weather forecast is drawn at the end of the fiscal year before the year to which it applies. The Actual Beta production is determined after Stage 2 of the next fiscal year.

Table 3.3. Weather Forecasts and Related Information by Fiscal Year within a 10-Year Cycle for ECL III (from Fiscal Year 2 of one Cycle through Fiscal Year 1 of the Next Cycle)

	Reported to Manager at the End of Stage 1 of the Fiscal Year in Leftmost Column								Basis of Beta Production at the End of Stage 2 of the Fiscal Year			
Fiscal Year	Specific Weather after Stage 2 of the Next Fiscal Year	Likelihood of <i>Beta</i> in the Next Fiscal Year	Max Possible <i>Beta</i> in the Next Fiscal Year	Advance Info for Fiscal Year	Forward General Weather	Mean Likelihood of <i>Beta</i>	Mean <i>Beta</i> Given General Weather if <i>Beta</i> is Realized	Fiscal Year	Specific Weather	Likelihood of <i>Beta</i>	Max Possible <i>Beta</i>	Actual <i>Beta</i> based on draw
1	M1	0.4	140	3	W	0.2	70					
2	W1	0.1	40	4	W	0.2	70	2	M1	0.4	140	140
3	W2	0.2	70	5	C	0.8	270	3	W1	0.1	40	0
4	C3	0.9	300	6	M	0.5	170	4	W2	0.2	70	0
5	M1	0.4	140	7	M	0.5	170	5	C3	0.9	300	300
6	M3	0.6	200	8	W	0.2	70	6	M1	0.4	140	0
7	W3	0.3	200	9	C	0.8	540	7	M3	0.6	200	200
8	C2	0.8	540	10	C	0.8	540	8	W3	0.3	200	0
9	C3	0.9	600	11	M	0.5	340	9	C2	0.8	540	540
10	M3	0.6	400	12	M	0.5	340	10	C3	0.9	600	600
				13	W	0.2	70	1	M3	0.6	400	400

Note: The specific weather forecast is drawn at the end of the fiscal year before the year to which it applies. The entries in the tables in Appendix C in the columns headed "Forecast One Year Ahead" are equal to the products of the seventh column from the left and the eighth column from the left in this table for the corresponding fiscal years. For example, for fiscal year 4 this value is 85.

Table 3.4. Minimum and Maximum *Fixer* Ending Balances by Credit Loss Rule and Period in Cycle for the Profit Maximizing Baseline

	ICL		ECL I		ECL II		ECL III	
Period	Min	Max	Min	Max	Min	Max	Min	Max
1	0	0	85	170	56	170	56	184
2	0	0	14	170	4	170	4	184
3	0	0	14	170	14	170	14	400
4	216	216	170	216	170	270	170	485
5	0	0	85	170	120	170	120	270
6	0	0	85	170	120	170	120	284
7	0	0	14	170	60	170	60	602
8	432	432	340	432	340	432	340	1034
9	432	432	340	432	340	540	340	710
10	0	0	170	340	204	340	204	425
1	NA	NA	NA	NA	NA	NA	56	184
2	NA	NA	NA	NA	NA	NA	4	184
3	NA	NA	NA	NA	NA	NA	14	400
4	NA	NA	NA	NA	NA	NA	170	485

Note: The ECL III treatment is conducted for one full cycle plus an addition four periods of a second cycle. The minimum and maximum values for ICL, ECL I, ECL II and ECL III are based on numbers report in Appendix C Tables C1, C2 and C3. For ICL the Min and Max values are both the Expected Beta. For ECL I the Min and Max values are Min (Expected Beta, Historical Average) and Max (Expected Beta, Historical Average, Interim Balance). For ECL II the Min and Max values the same as for ECL I (but because managers receive a specific rather than a general forecast, the Expected Beta values may differ across the rules). Finally, for ECL III, the Min and Max values are Min(Expected Beta, Historical Average) and Max (Expected Beta, Historical Average, Interim Balance) plus the Forecast One Year Ahead.

Appendix C. Detailed Calculations for Baseline Predictions Reported in Figures 2, 3, 4 and 5

Table C1 contains the derivation of baseline values by decision round (fiscal year) for ICL, ECL I, ECL II and ECL III when the profit-sharing compensation scheme is used and manager's maximize long-run profit by purchasing the maximum allowable *Fixer* in each round.

Table C2 contains the derivation of baseline values by decision round (fiscal year) for ICL, ECL I, ECL II and ECL III when the two-step compensation scheme is used and manager's first attempt to reach the bonus level of profit and if they can reach it then use the remaining profit to purchase *Fixer*. If it is not possible to reach the bonus level of profit, they purchase the maximum possible *Fixer*.

Table C3 contains the derivation of baseline value by decision round (fiscal year) for ICL, ECL I, ECL II and ECL III when the Healy compensation scheme is used and manager's first attempt to reach the maximum bonus level of profit and if they can reach it then use the remaining profit to purchase *Fixer*. If it is not possible to reach the level of profit that will generate a bonus, they purchase the maximum possible *Fixer* with the profit they have.

Table C1. Derivation of Baseline Values by Decision Round (Fiscal Year) for ICL, ECL I, ECL II and ECL III when the Profit-Sharing Compensation Scheme is Used*

		Select a value that ranges between the Minimum and Maximum																				
		Fixer Allowed to Buy					End of Stage 2					Subject Decision										
Rule	Fiscal Year	Weather Forecast at the End of Fiscal Year				Historical Average	Forecast One Year Ahead	Range		Sp. Weather	Prob. of β	Est. β units	Act. β Prod.	Act. α Prod.	Begin Bal	Used	Interim Bal	Bought	Returned	Desired End Bal	Profit	Salary 5%
		G	Weather	Prob. of β	Est. β units	Expected β		Min.	Max													
ICL	1	M	0.5	170	0	N/A	N/A	100	100	N/A	N/A	N/A	N/A	N/A	100	0	100	0	0	100	N/A	N/A
ICL	2	W	0.2	70	0	N/A	N/A	0	0	M1	0.4	140	140	560	100	100	0	0	0	0	3800	190
ICL	3	W	0.2	70	0	N/A	N/A	0	0	W1	0.1	40	0	700	0	0	0	0	0	0	4200	210
ICL	4	C	0.8	270	216	N/A	N/A	216	216	W2	0.2	70	0	700	0	0	0	216	0	216	2904	145
ICL	5	M	0.5	170	0	N/A	N/A	0	0	C3	0.9	300	300	400	216	216	0	0	0	0	3360	168
ICL	6	M	0.5	170	0	N/A	N/A	0	0	M3	0.6	200	0	700	0	0	0	0	0	0	4200	210
ICL	7	W	0.2	70	0	N/A	N/A	0	0	M3	0.6	200	200	500	0	0	0	0	0	0	2200	110
ICL	8	C	0.8	540	432	N/A	N/A	432	432	W3	0.3	200	0	700	0	0	0	432	0	432	1608	80
ICL	9	C	0.8	540	432	N/A	N/A	432	432	C2	0.8	540	540	160	432	432	0	432	0	432	528	26
ICL	10	M	0.5	340	0	N/A	N/A	0	0	C3	0.9	600	600	100	432	432	0	0	0	0	2520	126
ICL	11	M	0.5	170	0	N/A	N/A	0	0	M3	0.6	340	400	300	0	0	0	0	0	0	200	10
ICL	12	W	0.2	70	0	N/A	N/A	0	0	M1	0.4	140	140	560	0	0	0	0	0	0	2800	140
ICL	13	W	0.2	70	0	N/A	N/A	0	0	W1	0.1	40	0	700	0	0	0	0	0	0	4200	210
ICL	14	C	0.8	270	216	N/A	N/A	216	216	W2	0.2	70	0	700	0	0	0	216	0	216	2904	145
ICL	15	M	0.5	170	0	N/A	N/A	0	0	C3	0.9	300	300	400	216	216	0	0	0	0	3360	168
ICL	16	M	0.5	170	0	N/A	N/A	0	0	M1	0.4	140	0	700	0	0	0	0	0	0	4200	210
ICL	17	W	0.2	70	0	N/A	N/A	0	0	M3	0.6	200	200	500	0	0	0	0	0	0	2200	110
ICL	18	C	0.8	540	432	N/A	N/A	432	432	W3	0.3	200	0	700	0	0	0	432	0	432	1608	80
ICL	19	C	0.8	540	432	N/A	N/A	432	432	C2	0.8	540	540	160	432	432	0	432	0	432	528	26
ICL	20	M	0.5	340	0	N/A	N/A	0	0	C3	0.9	600	600	100	432	432	0	0	0	0	2520	126
ECL I	21	M	0.5	170	85	170	N/A	85	170	M3	0.6	340	400	300	0	0	0	170	0	170	-820	-41
ECL I	22	W	0.2	70	14	170	N/A	14	170	M1	0.4	140	140	560	170	140	30	140	0	170	3360	168
ECL I	23	W	0.2	70	14	170	N/A	14	170	W1	0.1	40	0	700	170	0	170	0	0	170	4200	210
ECL I	24	C	0.8	270	216	170	N/A	170	216	W2	0.2	70	0	700	170	0	170	46	0	216	3924	196
ECL I	25	M	0.5	170	85	170	N/A	85	170	C3	0.9	300	300	400	216	216	0	170	0	170	2340	117
ECL I	26	M	0.5	170	85	170	N/A	85	170	M1	0.4	140	0	700	170	0	170	0	0	170	4200	210
ECL I	27	W	0.2	70	14	170	N/A	14	170	M3	0.6	200	200	500	170	170	0	170	0	170	2880	144
ECL I	28	C	0.8	540	432	340	N/A	340	432	W3	0.3	200	0	700	170	0	170	262	0	432	2628	131
ECL I	29	C	0.8	540	432	340	N/A	340	432	C2	0.8	540	540	160	432	432	0	432	0	432	528	26
ECL I	30	M	0.5	340	170	340	N/A	170	340	C3	0.9	600	600	100	432	432	0	340	0	340	480	24
ECL II	31	M1	0.4	140	56	170	N/A	56	170	M3	0.6	340	400	300	340	340	0	170	0	170	2580	129
ECL II	32	W1	0.1	40	4	170	N/A	4	170	M1	0.4	140	140	560	170	140	30	140	0	170	3360	168
ECL II	33	W2	0.2	70	14	170	N/A	14	170	W1	0.1	40	0	700	170	0	170	0	0	170	4200	210
ECL II	34	C3	0.9	300	270	170	N/A	170	270	W2	0.2	70	0	700	170	0	170	100	0	270	3600	180
ECL II	35	M3	0.6	200	120	170	N/A	120	170	C3	0.9	300	300	400	270	270	0	170	0	170	2880	144
ECL II	36	M3	0.6	200	120	170	N/A	120	170	M1	0.4	140	0	700	170	0	170	0	0	170	4200	210
ECL II	37	W3	0.3	200	60	170	N/A	60	170	M3	0.6	200	200	500	170	170	0	170	0	170	2880	144
ECL II	38	C2	0.8	540	432	340	N/A	340	432	W3	0.3	200	0	700	170	0	170	262	0	432	2628	131
ECL II	39	C3	0.9	600	540	340	N/A	340	540	C2	0.8	540	540	160	432	432	0	540	0	540	-120	-6
ECL II	40	M3	0.6	340	204	340	N/A	204	340	C3	0.9	600	600	100	540	540	0	340	0	340	1560	78
ECL III	41	M1	0.4	140	56	170	14	56	184	M3	0.6	340	400	300	340	340	0	184	0	184	2496	125
ECL III	42	W1	0.1	40	4	170	14	4	184	M1	0.4	140	140	560	184	140	44	140	0	184	3360	168
ECL III	43	W2	0.2	70	14	170	216	14	400	W1	0.1	40	0	700	184	0	184	216	0	400	2904	145
ECL III	44	C3	0.9	300	270	170	85	170	485	W2	0.2	70	0	700	400	0	400	85	0	485	3690	185
ECL III	45	M3	0.6	200	120	170	85	120	270	C3	0.9	300	300	400	485	300	185	85	0	270	3690	185
ECL III	46	M3	0.6	200	120	170	14	120	284	M1	0.4	140	0	700	270	0	270	14	0	284	4116	206
ECL III	47	W3	0.3	200	60	170	432	60	602	M3	0.6	200	200	500	284	200	84	538	0	602	1032	52
ECL III	48	C2	0.8	540	432	340	432	340	1034	W3	0.3	200	0	700	602	0	602	432	0	1034	1608	80
ECL III	49	C3	0.9	600	540	340	170	340	710	C2	0.8	540	540	160	1034	540	494	216	0	710	2904	145
ECL III	50	M3	0.6	340	204	340	85	204	425	C3	0.9	600	600	100	710	600	110	315	0	425	2310	116
ECL III	51	M1	0.4	140	56	170	14	56	184	M3	0.6	340	400	300	425	400	25	159	0	184	3246	162
ECL III	52	W1	0.1	40	4	170	14	4	184	M1	0.4	140	140	560	184	140	44	140	0	184	3360	168
ECL III	53	W2	0.2	70	14	170	216	14	400	W1	0.1	40	0	700	184	0	184	216	0	400	2904	145
ECL III	54	C3	0.9	300	270	170	85	170	485	W2	0.2	70	0	700	400	0	400	85	0	485	3690	185

* The manager in the Profit-Sharing Baseline receives 5% of the total profit earned by the plant. The manager selects a Desired Ending Balance that is the maximum allowable Fixer. This strategy assumes that the manager is forward looking and recognizes that profit for the plant (and thereby the manager's compensation) will be maximized over the cycle by always purchasing the maximum allowed amount of Fixer.

Table C2. Derivation of Baseline Values by Decision Round (Fiscal Year) for ICL, ECL I, ECL II and ECL III when the Two-Step Compensation Scheme is Used*

		Select a value that ranges between the Minimum and Maximum												Subject Decision										
Rule	Fiscal Year	Weather Forecast at the end of Fiscal Year					Historical Average	Forecast One Year Ahead	Range		End of Stage 2					Filer Inventory Changes During FY							Profit	Salary TS
		G	Weather	Prob. of β	Est. β units	Expected β			Min.	Max	Sp. Weather	Prob. of β	Est. β units	Act. β Prod.	Act. α Prod.	Begin Bal	used	Interim Bal	Bought	Returned	Desired End Bal			
ICL	1	M		0.5	170	0	N/A	N/A	100	100	N/A	N/A	N/A	N/A	N/A	100	0	100	0	0	0	100	N/A	N/A
ICL	2	W		0.2	70	0	N/A	N/A	0	0	M1	0.4	140	140	560	100	100	0	0	0	0	0	3800	146
ICL	3	W		0.2	70	0	N/A	N/A	0	0	W1	0.1	40	0	0	0	0	0	0	0	0	0	4200	146
ICL	4	C	0.8	270	216	N/A	N/A	216	216	W2	0.2	70	0	0	0	0	0	216	0	216	0	216	2904	146
ICL	5	M	0.5	170	0	N/A	N/A	0	0	C3	0.9	300	300	400	216	216	0	0	0	0	0	0	3360	146
ICL	6	M	0.5	170	0	N/A	N/A	0	0	M3	0.6	200	0	0	0	0	0	0	0	0	0	0	4200	146
ICL	7	W	0.2	70	0	N/A	N/A	0	0	M3	0.6	200	200	500	0	0	0	0	0	0	0	0	2200	96
ICL	8	C	0.8	540	432	N/A	N/A	432	432	W3	0.3	200	0	0	0	0	0	432	0	432	0	432	1608	96
ICL	9	C	0.8	540	432	N/A	N/A	432	432	C2	0.8	540	540	160	432	432	0	432	0	432	0	432	528	96
ICL	10	M	0.5	340	0	N/A	N/A	0	0	C3	0.9	600	600	100	432	432	0	0	0	0	0	0	2520	146
ICL	11	M	0.5	170	0	N/A	N/A	0	0	M3	0.6	340	400	300	0	0	0	0	0	0	0	0	200	96
ICL	12	W	0.2	70	0	N/A	N/A	0	0	M1	0.4	140	140	560	0	0	0	0	0	0	0	0	2800	146
ICL	13	W	0.2	70	0	N/A	N/A	0	0	W1	0.1	40	0	0	0	0	0	0	0	0	0	0	4200	146
ICL	14	C	0.8	270	216	N/A	N/A	216	216	W2	0.2	70	0	0	0	0	0	216	0	216	0	216	2904	146
ICL	15	M	0.5	170	0	N/A	N/A	0	0	C3	0.9	300	300	400	216	216	0	0	0	0	0	0	3360	146
ICL	16	M	0.5	170	0	N/A	N/A	0	0	M1	0.4	140	0	0	0	0	0	0	0	0	0	0	4200	146
ICL	17	W	0.2	70	0	N/A	N/A	0	0	M3	0.6	200	200	500	0	0	0	0	0	0	0	0	2200	96
ICL	18	C	0.8	540	432	N/A	N/A	432	432	W3	0.3	200	0	0	0	0	0	432	0	432	0	432	1608	96
ICL	19	C	0.8	540	432	N/A	N/A	432	432	C2	0.8	540	540	160	432	432	0	432	0	432	0	432	528	96
ICL	20	M	0.5	340	0	N/A	N/A	0	0	C3	0.9	600	600	100	432	432	0	0	0	0	0	0	2520	146
ECL I	21	M	0.5	170	85	170	N/A	85	170	M3	0.6	340	400	300	0	0	0	170	0	170	0	170	820	96
ECL I	22	W	0.2	70	14	170	N/A	14	170	M1	0.4	140	140	560	170	140	30	140	0	170	0	170	3360	146
ECL I	23	W	0.2	70	14	170	N/A	14	170	W1	0.1	40	0	0	0	0	0	170	0	170	0	170	4300	146
ECL I	24	C	0.8	270	216	170	N/A	170	216	W2	0.2	70	0	0	0	0	0	170	46	0	216	3924	146	
ECL I	25	M	0.5	170	85	170	N/A	85	170	C3	0.9	300	300	400	216	216	0	141	0	141	0	141	2502	146
ECL I	26	M	0.5	170	85	170	N/A	85	170	M1	0.4	140	0	0	0	0	143	27	0	170	0	170	4038	146
ECL I	27	W	0.2	70	14	170	N/A	14	170	M3	0.6	200	200	500	170	170	0	170	0	170	0	170	2880	146
ECL I	28	C	0.8	540	432	340	N/A	340	432	W3	0.3	200	0	0	0	0	170	262	0	432	0	432	2628	146
ECL I	29	C	0.8	540	432	340	N/A	340	432	C2	0.8	540	540	160	432	432	0	432	0	432	0	432	528	96
ECL I	30	M	0.5	340	170	340	N/A	170	340	C3	0.9	600	600	100	432	432	0	340	0	340	0	340	480	96
ECL II	31	M1	0.4	140	56	170	N/A	56	170	M3	0.6	340	400	300	340	340	0	170	0	170	0	170	2580	146
ECL II	32	W1	0.1	40	4	170	N/A	4	170	M1	0.4	140	140	560	170	140	30	140	0	170	0	170	3360	146
ECL II	33	W2	0.2	70	14	170	N/A	14	170	W1	0.1	40	0	0	0	0	0	170	0	170	0	170	4300	146
ECL II	34	C3	0.9	300	270	170	N/A	170	270	W2	0.2	70	0	0	0	0	0	170	100	0	270	3600	146	
ECL II	35	M3	0.6	200	120	170	N/A	120	170	C3	0.9	300	300	400	270	270	0	170	0	170	0	170	2880	146
ECL II	36	M3	0.6	200	120	170	N/A	120	170	M1	0.4	140	0	0	0	0	170	0	0	0	0	170	4200	146
ECL II	37	W3	0.3	200	60	170	N/A	60	170	M3	0.6	200	200	500	170	170	0	170	0	170	0	170	2880	146
ECL II	38	C2	0.8	540	432	340	N/A	340	432	W3	0.3	200	0	0	0	0	170	262	0	432	0	432	2628	146
ECL II	39	C3	0.9	600	540	340	N/A	340	540	C2	0.8	540	540	160	432	432	0	519	0	519	0	519	6	96
ECL II	40	M3	0.6	340	204	340	N/A	204	340	C3	0.9	600	600	100	519	519	0	340	0	340	0	340	1350	96
ECL III	41	M1	0.4	140	56	170	14	56	184	M3	0.6	340	400	300	340	340	0	181	0	181	0	181	2502	146
ECL III	42	W1	0.1	40	4	170	14	4	184	M1	0.4	140	140	560	183	140	43	141	0	184	0	184	3364	146
ECL III	43	W2	0.2	70	14	170	216	14	400	W1	0.1	40	0	0	0	0	184	216	0	400	0	400	2904	146
ECL III	44	C3	0.9	300	270	170	85	170	485	W2	0.2	70	0	0	0	0	0	400	85	0	485	3690	146	
ECL III	45	M3	0.6	200	120	170	85	120	270	C3	0.9	300	300	400	485	300	185	85	0	270	0	270	3690	146
ECL III	46	M3	0.6	200	120	170	14	120	284	M1	0.4	140	0	0	0	0	270	14	0	270	0	284	4116	146
ECL III	47	W3	0.3	200	60	170	432	60	492	M3	0.6	200	200	500	284	280	84	282	0	366	0	366	2508	146
ECL III	48	C2	0.8	540	432	340	432	340	864	W3	0.3	200	0	0	0	0	366	282	0	648	0	648	2508	146
ECL III	49	C3	0.9	600	540	340	170	340	710	C2	0.8	540	540	160	648	540	108	282	0	390	0	390	2508	146
ECL III	50	M3	0.6	340	204	340	85	204	425	C3	0.9	600	600	100	390	390	0	349	0	349	0	349	6	96
ECL III	51	M1	0.4	140	56	170	14	56	184	M3	0.6	340	400	300	349	349	0	184	0	184	0	184	2586	146
ECL III	52	W1	0.1	40	4	170	14	4	184	M1	0.4	140	140	560	184	140	44	140	0	184	0	184	3360	146
ECL III	53	W2	0.2	70	14	170	216	14	400	W1	0.1	40	0	0	0	0	184	216	0	400	0	400	2904	146
ECL III	54	C3	0.9	300	270	170	85	170	485	W2	0.2	70	0	0	0	0	0	400	85	0	485	3690	146	

* The manager in the Two-Step Baseline firsts selects a Desired Ending Balance that is the maximum allowable Filer. This is adjusted downward until profit reaches L\$2501. This will ensure the L\$50 bonus.
If profit is less than L\$2500 before any filer purchase decision is made, the manager will purchase the maximum allowable Filer that will assure that profit is greater than zero.
This strategy assumes that the manager with the Two-Step Compensation Scheme first tries assure a profit that will provide a bonus in the current period and after that plans for the future by stocking up on Filer.

Table C3. Derivation of Baseline Values by Decision Round (Fiscal Year) for ICL, ECL I, ECL II and ECL III when the Healy Compensation Scheme is Used*

		Risk Allowed to Buy										Select a value that ranges between the Minimum and Maximum										Subject Decision			
		Weather Forecast at the End of Fiscal Year					Historical Average		Forecast One Year Ahead		Range		End of Stage 2					Risk Inventory Changes During FY							
Rule	Fiscal Year	G. Weather	Prob. of β	Est. β units	Expected β			Min.	Max	Sp. Weather	Prob. of β	Est. β units	Act. β Prod.	Act. α Prod.	Begin Bal	used	Interim Bal	Bought	Returned	Desired End Bal	Profit	Salary H			
ICL	1	M	0.5	170	0	N/A	N/A	0	100	NA	NA	NA	NA	NA	100	0	100	0	0	100	0	0			
ICL	2	W	0.2	70	0	N/A	N/A	0	0	M1	0.4	140	140	560	100	100	0	0	0	0	3800	265			
ICL	3	W	0.2	70	0	N/A	N/A	0	0	W1	0.1	40	0	700	0	0	0	0	0	0	4200	300			
ICL	4	C	0.8	270	216	N/A	N/A	216	216	W2	0.2	70	0	700	0	0	0	216	0	216	2904	117			
ICL	5	M	0.5	170	0	N/A	N/A	0	0	C3	0.9	300	300	400	216	216	0	0	0	0	3360	192			
ICL	6	M	0.5	170	0	N/A	N/A	0	0	M3	0.6	200	0	700	0	0	0	0	0	0	4200	300			
ICL	7	W	0.2	70	0	N/A	N/A	0	0	M3	0.6	200	200	500	0	0	0	0	0	0	2200	50			
ICL	8	C	0.8	540	432	N/A	N/A	432	432	W3	0.3	200	0	700	0	0	0	432	0	432	1608	50			
ICL	9	C	0.8	540	432	N/A	N/A	432	432	C2	0.8	540	540	160	432	432	0	432	0	432	528	50			
ICL	10	M	0.5	170	0	N/A	N/A	0	0	C3	0.9	600	600	100	432	432	0	0	0	0	2520	53			
ICL	11	M	0.5	170	0	N/A	N/A	0	0	M3	0.6	540	400	500	0	0	0	0	0	0	200	50			
ICL	12	W	0.2	70	0	N/A	N/A	0	0	M1	0.4	140	140	560	0	0	0	0	0	0	2800	100			
ICL	13	W	0.2	70	0	N/A	N/A	0	0	W1	0.1	40	0	700	0	0	0	0	0	0	4200	300			
ICL	14	C	0.8	270	216	N/A	N/A	216	216	W2	0.2	70	0	700	0	0	0	216	0	216	2904	117			
ICL	15	M	0.5	170	0	N/A	N/A	0	0	C3	0.9	300	300	400	216	216	0	0	0	0	3360	192			
ICL	16	M	0.5	170	0	N/A	N/A	0	0	M1	0.4	140	0	700	0	0	0	0	0	0	4200	300			
ICL	17	W	0.2	70	0	N/A	N/A	0	0	M3	0.6	200	200	500	0	0	0	0	0	0	2200	50			
ICL	18	C	0.8	540	432	N/A	N/A	432	432	W3	0.3	200	0	700	0	0	0	432	0	432	1608	50			
ICL	19	C	0.8	540	432	N/A	N/A	432	432	C2	0.8	540	540	160	432	432	0	432	0	432	528	50			
ICL	20	M	0.5	170	0	N/A	N/A	0	0	C3	0.9	600	600	100	432	432	0	0	0	0	2520	53			
ECL I	21	M	0.5	170	85	170	N/A	85	170	M3	0.6	540	400	500	0	0	0	170	0	170	520	0			
ECL I	22	W	0.2	70	14	170	N/A	14	170	M1	0.4	140	140	560	170	140	30	33	0	63	4002	300			
ECL I	23	W	0.2	70	14	170	N/A	14	170	W1	0.1	40	0	700	63	0	63	33	0	96	4002	300			
ECL I	24	C	0.8	270	216	170	N/A	170	216	W2	0.2	70	0	700	96	0	96	33	0	129	4002	300			
ECL I	25	M	0.5	170	85	170	N/A	85	170	C3	0.9	300	300	400	129	129	0	216	0	216	1184	50			
ECL I	26	M	0.5	170	85	170	N/A	85	216	M1	0.4	140	0	700	216	0	216	0	0	216	4200	300			
ECL I	27	W	0.2	70	14	170	N/A	14	170	M3	0.6	200	200	500	216	200	16	33	0	48	4002	300			
ECL I	28	C	0.8	540	432	340	N/A	340	432	W3	0.3	200	0	700	49	0	49	383	0	432	1902	50			
ECL I	29	C	0.8	540	432	340	N/A	340	432	C2	0.8	540	540	160	432	432	0	432	0	432	528	50			
ECL I	30	M	0.5	170	170	340	N/A	170	340	C3	0.9	600	600	100	432	432	0	340	0	340	480	50			
ECL II	31	M1	0.4	140	56	170	N/A	56	170	M3	0.6	340	400	300	340	340	0	56	0	56	3264	176			
ECL II	32	W1	0.1	40	4	170	N/A	4	170	M1	0.4	140	140	560	56	56	0	4	0	4	3336	188			
ECL II	33	W2	0.2	70	14	170	N/A	14	170	W1	0.1	40	0	700	4	0	4	33	0	37	4002	300			
ECL II	34	C3	0.9	300	270	170	N/A	170	270	W2	0.2	70	0	700	37	0	37	133	0	170	3402	199			
ECL II	35	M3	0.6	200	120	170	N/A	120	170	C3	0.9	300	300	400	170	170	0	170	0	170	1800	50			
ECL II	36	M3	0.6	200	120	170	N/A	120	170	M1	0.4	140	0	700	170	0	170	0	0	170	4200	300			
ECL II	37	W3	0.3	200	60	170	N/A	60	170	M3	0.6	200	200	500	170	170	0	60	0	60	3540	222			
ECL II	38	C2	0.8	540	432	340	N/A	340	432	W3	0.3	200	0	700	60	0	60	280	0	340	2520	53			
ECL II	39	C3	0.9	600	540	340	N/A	340	540	C2	0.8	540	540	160	340	340	0	366	0	366	4	50			
ECL II	40	M3	0.6	340	204	340	N/A	204	340	C3	0.9	600	600	100	366	366	0	309	0	309	6	50			
ECL III	41	M1	0.4	140	56	170	14	56	184	M3	0.6	340	400	300	309	309	0	56	0	56	2954	125			
ECL III	42	W1	0.1	40	4	170	14	4	184	M1	0.4	140	140	560	56	56	0	4	0	4	3336	188			
ECL III	43	W2	0.2	70	14	170	216	14	386	W1	0.1	40	0	700	4	0	4	33	0	37	4002	300			
ECL III	44	C3	0.9	300	270	170	85	170	355	W2	0.2	70	0	700	37	0	37	133	0	170	3402	199			
ECL III	45	M3	0.6	200	120	170	85	120	255	C3	0.9	300	300	400	170	170	0	255	0	255	1370	50			
ECL III	46	M3	0.6	200	120	170	14	120	269	M1	0.4	140	0	700	255	0	255	14	0	269	4116	300			
ECL III	47	W3	0.3	200	60	170	432	60	602	M3	0.6	200	200	500	269	200	69	33	0	102	4002	300			
ECL III	48	C2	0.8	540	432	340	432	340	664	W3	0.3	200	0	700	102	0	102	238	0	140	2732	95			
ECL III	49	C3	0.9	600	540	340	170	340	710	C2	0.8	540	540	160	340	340	0	366	0	366	4	50			
ECL III	50	M3	0.6	340	204	340	85	204	425	C3	0.9	600	600	100	366	366	0	309	0	309	6	50			
ECL III	41	M1	0.4	140	56	170	14	56	184	M3	0.6	340	400	300	309	309	0	56	0	56	2954	125			
ECL III	42	W1	0.1	40	4	170	14	4	184	M1	0.4	140	140	560	56	56	0	4	0	4	3336	188			
ECL III	43	W2	0.2	70	14	170	216	14	386	W1	0.1	40	0	700	4	0	4	33	0	37	4002	300			
ECL III	44	C3	0.9	300	270	170	85	170	355	W2	0.2	70	0	700	37	0	37	133	0	170	3402	199			

* The manager in the Healy Baseline First, selects a Desired Ending balance that is the maximum allowable fixer. This is adjusted downward until profit reaches £34001. This will ensure the maximum bonus.
 If profit is less than £34000 but greater than £2500 +56*(minimum required fixer) before any fixer purchase decision is made, the manager will purchase the minimum required fixer.
 If profit is less than £2500 or if it will fall below £2500 by purchasing the minimum required fixer, the manager will purchase as much fixer as permitted without resulting in profit less than zero.
 This strategy assumes that the manager with the Healy compensation Scheme first tries to assure a profit that will provide a bonus in the current period and after that plans for the future by stocking up on fixer.

Appendix D. Section 4 Tables

Tables 4.1 through 4.4 were generated by SPSS software.

Table 4.1. Mauchly's Test of Sphericity*							
Profit		Desired Ending Balance		Quantity of Earnings Management		Adequacy	
Chi-Square	Sig.	Chi-Square	Sig.	Chi-Square	Sig.	Chi-Square	Sig.
38.722	0.000	90.672	0.000	81.537	0.000	42.116	0.000
*Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.							

Table 4.2. Levene's Test of Equality of Error Variances								
	Profit (df1=1, df2=39)		Desired Ending Balance (df1=1, df2=39)		Quantity of Earnings Management (df1=1, df2=39)		Adequacy (df1=1, df2=39)	
	F-Stat	Sig.	F-Stat	Sig.	F-Stat	Sig.	F-Stat	Sig.
ICL	.	.	.	.	.	.	.	.
ECL I	1.244	0.271	2.568	0.117	2.568	0.117	2.555	0.117
ECL II	0.500	0.483	1.077	0.305	0.495	0.485	0.669	0.418
ECL III	0.656	0.422	0.777	0.383	0.411	0.524	0.814	0.372
Note: The F-statistics and p-values for ICL are not applicable for this test. Because there is no flexibility regarding the decision to hold or not to hold Ending Balances there is no variance in the values associated with the ICL rule across compensation schemes.								

Table 4.3. Univariate Analysis – Test of Within-Subjects Effects with Greenhouse-Geisser Corrected Values

Panel A: Profit

	Type III Sum of Squares	df	Mean Square	F	Sig.
PROFIT	3,550,282	2.23	1,591,839	218.87	0.000
PROFIT * COMPENSATION	29,792	2.23	13,358	1.84	0.161
Error	632,630	86.98	7,273		

Panel B: Desired Ending Balances

	Type III Sum of Squares	df	Mean Square	F	Sig.
PROFIT	653413	1.331	490973	195.60	0.000
PROFIT * COMPENSATION	16931	1.331	12722	5.07	0.020
Error	130279	51.903	2510		

Panel C: Quantity of Earnings Management

	Type III Sum of Squares	df	Mean Square	F	Sig.
PROFIT	430882	1.429	301553	167.17	0.000
PROFIT * COMPENSATION	11157	1.429	7808	4.32	0.029
Error	100520	55.726	1804		

Panel D: Adequacy

	Type III Sum of Squares	df	Mean Square	F	Sig.
PROFIT	2.7525	1.80	1.531	236.00	0.000
PROFIT * COMPENSATION	0.0437	1.80	0.024	3.75	0.033
Error	0.4549	70.12	0.006		

Table 4.4. Univariate Analysis – Test of Between-Subjects Effects**Panel A: Profit**

	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	1069789923	1	1069789923	158261	0.000
Compensation	32761	1	32761	4.85	0.034
Error	263626	39	6760		

Panel B: Desired Ending Balances

	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	6468478	1	6468478	2043	0.000
Compensation	21315	1	21315	6.73	0.013
Error	123479	39	3166		

Panel C: Quantity of Earnings Management

	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	589155	1	589155	233	0.000
Compensation	16514	1	16514	6.55	0.014
Error	98265	39	2519		

Panel D: Adequacy

	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	70	1	70	5706	0.000
Compensation	0.023	1	0.023	1.85	0.181
Error	0.481	39	0.012		

Table 4.5. Profit indices by compensation scheme and profit-maximizing baseline and Rule							
	ECL II to ICL	ECL III to ICL	ECL III to ECL II	to Healy ECL II	to Baseline ECL II	to Healy ECL III	to Baseline ECL III
Two-Step	109.5	112.6	102.8	101.1	96.7	102.7	98.0
Healy	108.4	109.6	101.1	NA	95.7	NA	95.4
Profit Max Baseline	113.0	114.9	101.4	104.5	NA	104.8	NA

Table 4.6. Mean fiscal year profit and distribution of profit over good years and bad years during the productivity cycle for ECL II

Periods	ICL Baseline	Profit Max Baseline	Two- Step Baseline ECL II	Two- Step Actual ECL II*	Healy Baseline ECL II	Healy Actual ECL II*	Myopic Profit Max Baseline
1	200	2580	2580	2159	3264	2186	1564
2	2800	3360	3360	3372	3336	3587	3336
3	4200	4200	4200	4247	4002	4114	4140
4	2904	3600	3600	3379	3402	3267	3264
5	3360	2880	2880	2666	1880	2460	2180
6	4200	4200	4200	4240	4200	4220	4200
7	2200	2880	2880	2991	3540	3127	3040
8	1608	2628	2628	2523	2520	2327	2520
9	528	-120	6	76	4	220	160
10	2520	1560	1350	1206	6	1075	376
11	200	2496	2502	2140	2954	2208	1904
12	2800						
13	4200						
Mean Profit							
Good Yrs	3492.8	3648.0	3648.0	3580.8	3364.0	3529.6	3424.0
Bad Yrs	1411.2	1888.8	1873.2	1787.2	1804.8	1791.4	1600.0
St. Dev.							
Good Yrs	679.1	566.7	566.7	670.7	909.7	713.2	820.9
Bad Yrs	1017.0	1228.9	1197.8	1159.8	1682.4	1143.1	1283.0
CoV							
Good Yrs	0.194	0.155	0.155	0.187	0.270	0.202	0.240
Bad Yrs	0.721	0.651	0.639	0.649	0.932	0.638	0.802

Note: * The actual values are means over 21 observations for the Two-Step Compensation Scheme and over 20 observations for the Healy Compensation Scheme.

Table 4.7. Mean fiscal year profit and distribution of profit over good years and bad years during the productivity cycle for ECL III

Periods	ICL Baseline	Profit Max Baseline	Two- Step Baseline ECL III	Two- Step Actual ECL III*	Healy Baseline ECL III	Healy Actual ECL III*	Myopic Profit Max Baseline
1	200	3246	2856	2140	2954	2208	1904
2	2800	3360	3354	3315	3336	3451	3336
3	4200	2904	2904	3587	4002	3737	4140
4	2904	3690	3690	3732	3402	3592	3264
5	3360	3690	3690	2919	1370	2538	2180
6	4200	4116	4116	4365	4116	4331	4200
7	2200	1092	2508	1915	4002	2109	3040
8	1608	1608	2508	2952	2772	2608	2520
9	528	2904	2508	1206	4	1455	160
10	2520	2310	6	1466	6	851	376
11	200	3246	2586	2580	2954	2430	1904
12	2800	3360	3360	3402	3336	3524	3336
13	4200	2904	2904	3601	4002	3698	4140
Mean Profit							
Good Yrs	3492.8	3552.0	3550.8	3583.6	3245.2	3529.8	3424.0
Bad Yrs	1411.2	2232.0	2023.2	2023.8	1947.6	1890.6	1600.0
St. Dev.							
Good Yrs	679.1	450.8	451.5	535.4	1104.6	647.8	820.9
Bad Yrs	1017.0	890.9	1128.2	735.3	1834.4	728.7	1283.0
CoV							
Good Yrs	0.194	0.127	0.127	0.149	0.340	0.184	0.240
Bad Yrs	0.721	0.399	0.558	0.363	0.942	0.385	0.802
Note: * The actual values are means over 21 observations for the Two-Step Compensation Scheme and over 20 observations for the Healy Compensation Scheme.							

Table 4.8. T-statistics and p-values for analysis of profit and dispersion of profit during good years and bad years.				
	t-statistic	p-value	t-statistic	p-value
Profit	ICL vs Two-Step II		ICL vs Healy II	
Good Years	3.486	0.001	2.333	0.016
Bad Years	19.142	0.000	9.515	0.000
	ICL vs Two-Step III		ICL vs Healy III	
Good Years	2.982	0.004	1.147	0.133
Bad Years	13.018	0.000	10.464	0.000
CoV	ICL vs Two-Step II		ICL vs Healy II	
Good Years	1.657	0.944	0.260	0.601
Bad Years	-0.432	0.335	-0.476	0.320
	ICL vs Two-Step III		ICL vs Healy III	
Good Years	1.320	0.899	3.111	0.997
Bad Years	-1.881	0.038	0.641	0.736
Note: The signs of the t-statistics are expected to be positive for profit and negative for the coefficient of variation because the new rule should result in profits rising and dispersion being reduced. All tests are one-sided tests. II and III indicate that the rule is ECL II or ECL III.				