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Closed or Open Book for Invigilated Tests – Does It Make a Difference?

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Abstract: COVID-19 has had many impacts on economics education including assessment. One such impact has been the shift to more open book rather than closed book testing in order to retain flexibility to shift online at short notice. In this study, I compare the scores of students in a first year macroeconomics course at a New Zealand university from two different years. Both groups of students answered identical multiple-choice questions (that neither group of students had seen before) where the only difference in the assessment was closed vs open book. I compare both test formats at the total level and then compare scores across the two formats with questions grouped according to Bloom's taxonomy. I examine the difference in scores of groups of students, viz.: (1) gender; (2) international vs domestic; and (3) GPA grouping. Among other results, I find that students score better in open book tests in lower Bloom's taxonomy level questions but worse in higher. However, this effect does differ across different types of students, notably when comparing females and males and students with a higher or lower overall GPA.

Keywords: Principles of Economics Assessment, Multiple Choice, open book, closed book

JEL Classifications: A22

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INTRODUCTION

One of the most significant changes in the delivery of tertiary education in response to COVID-19 has been assessment. Face to face invigilated tests became difficult or impossible. Assessment shifted online or to other formats. One consequence of shifting tests to online was to abandon closed book testing and accept that tests would now be open book.

One important question to ask is, what difference to student outcomes does this make? There are two dimensions to think about here. First, what difference does it make to performance for the student? This can be hard to establish as assessors are likely to write different questions for open compared to closed book. In this study I take advantage of the fact that some questions used were identical to ones used in the past. Second, what difference does it make to student behaviour? Do students study more or less for open book compared to closed book? This can be difficult to observe. However, it might be possible to imply how behaviour changes by examining how scores are different for different types of students.

Another important question is who benefits and who loses from a shift from closed to open book tests? This has important implications for educators when deciding what format to use.

LITERATURE REVIEW

Conclusive evidence for the superiority however it is judged for open or closed book testing is difficult to find. It is of course not possible to conduct the perfect trial whereby the same students take the same test but under different conditions (closed vs. open) and the questions are new to the students each time. Having already sat the test students will have seen the questions before which will almost certainly bias results towards the 2nd test. Hence researchers are left having to make some compromise.

Phiri (1993) finds that there is little difference in the results of open and closed book tests. However, this study uses the same group of students and alters the test conditions over a course of study. A downside of this approach is that the students are usually being tested on different material and examiners write different types of questions due to the test conditions.

Agarwal et. al. (2008) find that open book tests initially lead to higher scores but that difference does not persist and retention was no different on later testing. In this study, different students were presented with the same questions under different testing conditions (which resembles my study here). However, the total number of students involved was relatively small (only 36 in total and these were divided into different groups) and students did not know in advance if they would receive an open or closed book test. An important element of the difference between open and closed book testing is the behavioural response of students in their study practices. The Agarwal (2008) study was an experiment outside of the context of a course so students received either credit towards completion of a research participation requirement or a cash payment. A 2012 study by Gharib et. al. finds a similar effect with higher initial scores on open book but no difference in longer term retention.

Agarwal and Roediger (2011) find more evidence for better short term performance with no difference on longer term performance. They also find that when students expect an open book test they spend less time studying which may degrade long term performance.

Rummer et. al. (2019) find better performance on later testing by students whose optional practice tests had been closed book compared to open book. However, the sample size is relatively small with 27 in the open book and 19 in the closed book groups.

Cade et. al. (2018) find better performance on open book although the study design used different tests on different material with open book used in an optional course and closed book in a compulsory course.
Phillips (2006) finds better performance on open book tests and that the impact was greatest on weaker students. However, the context here was small stakes in-class tests which simply tested text-book knowledge and so most likely are knowledge rather than understanding type questions.
Heijne-Penninga et. al. (2008b) find the combination of closed and open book tests reduces testing reliability slightly but not unacceptably.
Heijne-Penninga et. al. (2008a) find that students prepare better for closed book tests compared to open (a result contrary to their starting hypothesis) and that closed book test may therefore promote more deep learning.

METHOD

This study takes advantage of a change from closed to open book testing in a large introductory macroeconomics course at the University of Canterbury, New Zealand. Assessment in this course includes and has included for some time an invigilated term test (worth 20%) and a final exam (worth 50%). Until 2020 these were both closed book. Both assessment items contain multiple choice and constructed response type questions. In semester 1 of 2020 (February to June) testing shifted online due to COVID-19 and was by necessity open source. However, testing returned to being on-campus in semester 2 as COVID restrictions eased. To retain some measure of consistency between the two semesters the test and exam were open book in semester 2. The author realised there was an opportunity to test whether or not close or open book makes a difference to performance. The multiple-choice section used questions taken directly from previous test and exam papers but which the students did not have access to so had not seen before. Out of 55 questions across the test and exam, 46 were from previous papers. The course covered the same material and was taught by the same person both times.

The multiple choice questions are marked electronically allowing the difficulty and discrimination values for each question to be calculated. Multiple choice questions are used in this study as constructed response questions include the confounding factor of difference in marker across time which, even with the best of intentions, cannot be entirely eliminated.

The 46 questions were classified into different levels of Bloom's revised taxonomy (Anderson and Bloom, 2001). The following table sets out both 1 and 2 digit levels. Questions were classified to 2 digits but analysis was conducted at the 1 digit level. Appendix 2 reproduces table 5.1 from Anderson and Bloom (2001). The questions fell into one of the first three categories as appendix 1 details.

The classification of questions into Bloom's taxonomy meant that it was possible to investigate if there are differences in closed and open book tests for different cognitive level questions.

By combining individual response data with student administration data it was also possible to establish how different groups of students might be differently impacted. Students are grouped as follows:

- Source of student: International vs Domestic
- Gender: Female vs Male

- Overall GPA (A=7 - 9, B=4 - 6.99, C=1 - 3.99, Fail=-1 - 0.99)[1]

This study has a healthy sample size with 340 students in the closed book format and 248 in the open book.
The unique contribution of this study is the classification of questions into Bloom's Taxonomy.

RESULTS

Overall

Table 1: Overall difference in performance

	N	Mean	Std. Dev	Min	Max
Closed	340	72.9	14.58	26.32	100
Open	248	73.95	14.28	18.52	100
Difference		-1.05			
t-value		-0.87			
p-value		0.3824			

While the average overall score for open book is higher than for closed the difference is not significant.

By Question

Of the 46 questions, 22 have higher scores over all students when open book and 24 have lower. The difference is significant at the 10% or lower level for 17 questions and not significant for 29. The following table shows the percentage of students that answered a particular question correctly in each of the two formats and the difference between the two. Only significant differences are shown here. The question code in the first column refers to the questions listed in appendix 1 and the first number in the code denotes the Bloom taxonomy level, e.g. Q-1.02 is a level 1 (Remember) level question.

Table 2: Significant differences

Question	Closed	Open	Difference	t-value	P-value
Q-1.11	28.57	68.72	-40.15	-10.13	<.0001
Q-1.10	64.91	47.80	17.11	-8.57	<.0001
Q-1.02	66.77	85.66	-18.89	-5.28	<.0001
Q-1.05	46.59	61.07	-14.48	-3.48	0.0005
Q-1.04	74.48	83.20	-8.72	-2.52	0.0121
Q-1.16	79.81	86.34	-6.53	-1.99	0.0474
Q-3.08	54.97	63.00	-8.03	-1.88	0.0605
Q-1.09	73.60	79.74	-6.13	-1.66	0.0972
Q-2.01	59.35	52.05	7.30	1.75	0.0803

[1] A 10 point GPA scale is used at the University of Canterbury with A+=9, A=8 and so on down to C-=1, D=0 and E=-1. D and E grades are failing grades.

Q-1.18	82.30	74.45	7.85	2.23	0.026
Q-3.03	58.16	48.36	9.80	2.35	0.0193
Q-2.05	61.42	51.64	9.79	2.36	0.0186
Q-1.17	97.21	92.07	5.13	2.75	0.0061
Q-2.08	81.06	69.60	11.45	3.13	0.0018
Q-2.06	77.33	65.20	12.13	3.15	0.0017
Q-2.13	90.68	81.50	9.19	3.16	0.0017
Q-2.09	54.66	40.97	13.69	3.18	0.0015

What is notable here is that of the eight questions where performance in open book is better than closed book, seven are Bloom level 1. Of the nine questions where open book is actually worse, six are Bloom level 2.

By level of question

The table below shows how students performed overall on each group of Bloom level questions (e.g. the mean score for all level 1 questions in the open book format was 80.87).

Table 3: Differences in Student Score by Bloom Level

	Number	**Mean**	**Std. Dev**	**Min.**	**Max.**
Level 1 (Remember)					
Closed	340	74.85	15.64	15.79	100
Open	248	80.87	15.70	18.18	100
Difference		-6.02			
t-value		-4.6			
p-value		<.0001			
Level 2 (Understand)					
Closed	340	72.12	18.83	16.67	100
Open	248	68.43	18.49	5.56	100
Difference		3.69			
t-value		2.37			
p-value		0.0183			
Level 3 (Apply)					
Closed	340	69.59	19.16	11.11	100
Open	248	69.96	18.30	16.67	100
Difference		-0.37			
t-value		-0.23			
p-value		0.8147			

Overall, students do better on level 1 questions with open book but worse on level 2 with little difference on level 3 (though there were only 9 level 3 questions).

Gender

Table 4: Difference in Score by Gender

	Number	Mean	Std. Dev	Min	Max
Female					
Closed	115	70.01	14.13	26.32	95.65
Open	89	75.46	14.23	34.78	100.00
Difference		-5.45			
t-value		-2.72			
p-value		0.0071			
Male					
Closed	222	74.59	14.52	30.43	100.00
Open	153	73.28	14.34	18.52	100.00
Difference		1.31			
t-value		0.86			
p-value		0.3876			

Overall, females perform better in the open book format but it makes no significant difference to males. The effect is big enough to raise the average score for females above that of males when the format is open compared to closed.

When we further break this down into how each gender performed by level of question we find that females score 9.6 marks higher on level 1 questions ($p < 0.0001$) while males only score 3.9 marks higher ($p = 0.0203$). On level 2 questions there is no impact on females and the average scores are almost identical but males score 6.3 marks lower in open compared to closed book ($p = 0.0015$).

International vs Domestic

Table 5: Difference in Score by Source of Student

	Number	Mean	Std. Dev	Min	Max
International					
Closed	31	70.04	14.87	34.78	95.65
Open	19	72.82	13.55	45.65	93.48
Difference		-2.78			
t-value		-0.66			
p-value		0.5102			
Domestic					
Closed	306	73.33	14.49	26.32	100.00
Open	225	74.22	14.34	18.52	100.00
Difference		-0.89			
t-value		-0.7			
p-value		0.4864			

Although there appears to be no overall impact, there is an effect when looking at question level.

For domestic students they score 5.8 marks higher on level 1 questions ($p < 0.0001$) and 4.1 marks lower on level 2 ($p=0.0122$).

For international students they score 6.7 marks higher on level 1 questions although this is not significant at the 10% level ($p = 0.1514$). As with domestic international students score lower on level 2 questions by 3.7 marks but this is also not statistically significant. However, the sample sizes are small with only 31 and 19 students respectively making conclusions hard to draw.

GPA Grouping

Student administrative data includes their overall GPA. Students were group broadly into

- "A students" GPA 7 – 9.
- "B students" GPA 4 – 6.99
- "C students" GPA 1 – 3.99
- "D/E students" GPA -1 – 0.99

Table 6: Difference in Score by GPA group

	Number	**Mean**	**Std. Dev**	**Min**	**Max**
D/E Students					
Closed	30	51.02	9.12	34.78	71.74
Open	11	57.81	15.18	34.78	82.61
Difference		-6.79			
t-value		-1.75			
p-value		0.0874			
C Students					
Closed	119	65.63	10.65	30.43	93.48
Open	92	63.79	12.13	18.52	93.48
Difference		1.84			
t-value		1.17			
p-value		0.2442			
B Students					
Closed	131	78.78	10.49	26.32	97.83
Open	106	79.30	8.34	24.35	95.65
Difference		-0.52			
t-value		-0.41			
p-value		0.6794			
A Students					
Closed	55	87.67	7.13	67.39	100
Open	34	90.54	6.24	76.09	100
Difference		-2.87			
t-value		-1.93			
p-value		0.0565			

The open book format helped the weakest and the strongest students. However, the number of students in the D/E category is very small so it is hard to draw conclusions.
The overall score for C grade students is actually slightly lower for open book but the difference at the overall level is not statistically significant. However, when the C Student group is broken down into question type we find that these students score 3.5 marks higher on level 1 questions ($p=0.0777$) but 8.9 marks lower on level 2 questions ($p < 0.0001$). For B students the pattern is the same and they score 5.9 marks higher on level 1 questions ($p < 0.0001$) but 5.2 marks lower on level 2 ($p=0.0014$). For A students they also score higher on level 1 by 6.5 marks ($p < 0.0001$) but open book makes no difference for higher level questions.

Difficulty and Discrimination Index

Table 7: Overall Impact on Difficulty and Discrimination Indices

	N	Mean	Std. Dev.	Min.	Max.
Difficulty Index					
Closed	46	0.7348	0.1605	0.2857	0.9752
Open	46	0.7455	0.1493	0.4097	0.978
Difference		-0.0107			
t-value		-0.33			
p-value		0.7411			
Discrimination Index					
Closed	46	0.2982	0.0979	0.0649	0.4988
Open	46	0.2804	0.1271	-0.0315	0.4873
Difference		0.0178			
t-value		0.75			
p-value		0.4536			

The difficulty index is simply the proportion of students for that question who answered correctly and so really just mirrors the analysis by question reported above. Overall there is no change to the average level of difficulty. However there are some significant changes by question as the analysis above shows.

The discrimination index for a question is calculated by subtracting the number of students who are in the bottom half overall and got that question correct from the number who got it correct in the top half and dividing by the total number.

The table below shows the largest changes for the discrimination but excluding questions where the difficulty index exceeds 0.9 for both test formats. Questions with a difficulty index higher than 0.9 have less reliable discrimination as almost all students get the question right.

Table 8: Largest Changes in Discrimination Indices by Question

	Discrimination			Difficulty	
Question	**Difference**	**Closed**	**Open**	**Closed**	**Open**
Q-1.11	-0.103	0.31	0.41	0.29	0.69
Q-1.10	-0.096	0.17	0.27	0.65	0.94
Q-2.04	-0.087	0.13	0.22	0.44	0.49
Q-2.11	-0.084	0.20	0.29	0.61	0.56
Q-1.06	0.087	0.22	0.14	0.89	0.89
Q-1.09	0.088	0.30	0.21	0.74	0.80
Q-2.16	0.089	0.50	0.41	0.80	0.85
Q-2.12	0.114	0.29	0.18	0.83	0.82

Q-3.07	0.156	0.17	0.01	0.68	0.61
Q-3.02	0.158	0.35	0.19	0.86	0.83
Q-2.10	0.161	0.26	0.10	0.67	0.69
Q-2.18	0.171	0.45	0.28	0.89	0.88
Q-2.03	0.173	0.43	0.26	0.83	0.78

What is interesting here is that lower level questions appear to have increased discrimination and higher level have reduced discrimination. What this might indicate is that the advantage to notes for the lower order questions for the lower half students is possibly higher than it is for upper half students.

DISCUSSION

Some common themes emerge.

Students perform better at lower level questions and worse at higher level. Given that both types of questions were used in both tests the difference between closed and open book format overall turns out to be insignificant. However, a different test design would see a different outcome. Tests that contain predominantly lower level questions (remember) would result in higher test scores while tests predominantly containing higher level (understand, apply) would result in lower test scores.

The different effect by question type is most marked when students are grouped according to GPA. The drop in performance on higher level questions in open book format is largest for weaker students. This may indicate that weaker level students are more likely to change their study behaviour (to their detriment) compared to the stronger students. For stronger students their performance on higher level questions is unchanged. It's plausible that their study habits change very little as they were diligent in the first place and remain so regardless of format.

Open book advantages females. The advantage here is sufficient to close the gap in performance between male and female. Interestingly females do just as well on the higher order questions under both formats but males do not. This might indicate that males are more likely to rely on their notes and change their study habits in response to an open book test. This finding on male compared to female is of interest to all teachers of economics who are aware of the performance gap in economics of females compared to males. Females also typically perform worse on multiple choice questions compared to males. Open book testing may well be a useful strategy in raising female performance.

An interesting side case or two…

Some questions that had been previously used in the closed book format were modified to make them slightly more challenging in the open book format. These questions were excluded from the analysis above. However, one question presents an interesting result. The following question was used in the closed book format test:

Nominal values
1. are calculated using fixed quantities.
2. must increase when underlying prices increase.
3. only change when underlying quantities change.
4. are measured in the prices that prevailed at the time.

The correct answer is 4 and 276 out of 337 students (82%) answered it correctly. However, in the open book format answer 2 was changed to:

2. must increase when underlying prices **or** quantities increase.

This answer is still incorrect. However, only 50% of the students now chose the correct answer while 41% chose answer 2 (only 11% chose answer 2 in the closed format). The addition of the words "or quantities" clearly distracted more students and caused them to answer incorrectly. The lesson here is to be aware of question complexity. While for us as economists this may seem like a fairly innocuous change, it clearly made the question more difficult to the student. That complexity arises

from now having to compare to states to determine correctness. "Or" statements are hard to deal with.

This question was used in the closed book format test:

> In the AD/AS model an autonomous increase in government spending will lead to
> 1. an increase in P and an increase in Y.
> 2. an increase in P and a decrease in Y.
> 3. a decrease in P and a decrease in Y.
> 4. a decrease in P and an increase in Y.

In the open book format the stem of the question was changed to

> In the AD/AS model a decrease in taxes with no change in government expenditure will lead to

The first question is more straightforward and further was an example used in class. The open book format question required more thought and would be classified as Bloom level 2 or 3. In the closed book test, 89% of students selected the correct answer but in the open book format only 57% of students did with the remainder being evenly spread over the incorrect answers. Given the results above this is unsurprising.

CONCLUSION

The notion that open book testing advantages students on all fronts is not correct. Students clearly score higher on lower level questions and this is consistent regardless of how students are grouped. This is not surprising – notes should assist questions that rely on remembering.

However, by and large, students perform worse in open book formats on higher level questions. One plausible theory for this is that they do not prepare as well for open book as they do for closed book. Having access to notes does not aid understanding and application type questions if the material has not been understood or learned in the first place.

This effect is different for different groups of students. The drop in performance is greatest for weaker students and for males.

So contrary to some views that open book tests simply advantage students who do not work as hard the reverse may be the case. Further, the use of open book tests may be one useful strategy in closing the gap that exists in female performance in economics compared to male.

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APPENDICES

APPENDIX 1 CLASSIFICATION OF QUESTIONS INTO BLOOM'S REVISED TAXONOMY

Level 1 - REMEMBER

1.01 Which of the following is true?
1. A change in the market price of a good will shift the demand curve.
2. The supply curve for a good slopes upwards due to inflation.
3. If the market price is above equilibrium then the government will regulate the price back to equilibrium to protect consumers.
4. Demand curves slope downwards because as the price of a good rises consumers are unable to purchase as much of it with a given income.

1.02 Which famous economist saw the Great Depression of the 1930's as a failure of orthodox economic thinking?
1. David Ricardo.
2. Karl Marx.
3. John Maynard Keynes.
4. Milton Friedman.

1.03 What event in the 1970's gave rise to higher inflation rates around most of the world?
1. The Vietnam War.
2. The rise of Japan as an industrial power.
3. The formation of the European Union.
4. The rise in the price of oil.

1.04 Which decade is most associated with economic reform in New Zealand, the USA and Great Britain?
1. 1960s.
2. 1970s.
3. 1980s.
4. 1990s.

1.05 Which of the following is not consistent with world economic data?
1. Europe has always had much higher incomes than Africa.
2. Almost all of the rise in incomes in the West since the year 1 A.D. has occurred in the last 300 years.
3. In 1800 life expectancy in the richest parts of the world was around 40.
4. World trade fell between the two world wars compared to the pre WWI period.

1.06 New Zealand's GDP is a measure of
1. all the income earned by New Zealanders.
2. the goods and services that New Zealanders consume.
3. expenditure on final goods and services produced in New Zealand.

4. the well-being and living standard of those who live in New Zealand.

1.07 The main advantage of using a Laspeyres index formula to calculate the CPI is
1. it is relatively cheap to compile.
2. it is the most accurate of all index measures.
3. it is the one the public understands.
4. the weights do not go out of date.

1.08 Dividends paid to foreign owners of NZ companies are included in which part of the New Zealand balance of payments?
1. The current account.
2. The capital account.
3. The financial transactions account.
4. The exports of goods and services balance.

1.09 Adam Smith argued which of the following?
1. It is not the accumulation of gold and silver that increases well-being but what can be done with gold and silver.
2. From each according to his abilities, to each according to his needs.
3. "Positive checks" of war, famine and plague would keep the population in check and make an improvement in quality of life impossible.
4. The Government should intervene in the economy to smooth out the peaks and troughs and reduce the impact of unemployment.

1.10 After the First World War (1914 – 18) much of the developed world attempted to return to what sort of exchange rate regime?
1. Floating exchange rates.
2. Exchange rates fixed to the $US.
3. The gold standard.
4. Managed floats.

1.11 Many of the economic reforms of the 1980's and early 1990's were designed to
1. increase the involvement of government in the economy.
2. provide protection to NZ firms competing with foreign firms.
3. restore confidence in the $NZ.
4. introduce competition into important markets.

1.12 Firms will hedge their foreign exchange transactions in order to
1. make foreign exchange transaction profits.
2. eliminate risk.
3. take advantage of exchange rate fluctuations.
4. protect against interest rate fluctuations.

1.13 In a fixed exchange rate regime

1. the central bank limits the supply of domestic currency.
2. the exchange rate cannot be changed.
3. the central bank buys or sells domestic currency to maintain the chosen exchange rate.
4. it is possible to devalue the domestic currency against one other currency and leave all other rates unchanged.

1.14 Why might firms voluntarily pay above market rates?

1. Because they make errors.
2. Because they don't know what the market rate is.
3. Because their employees might strike if they don't.
4. Because they wish to reduce worker turnover.

1.15 The term "money neutrality" refers to the idea that

1. money has no impact on economic variables.
2. money has no long run impact on real variables.
3. holding money will give a zero return.
4. the Reserve Bank cannot influence the economy in the long run.

1.16 In terms of monetary systems, the Gold Standard refers to

1. an economy that uses gold as money for day to day transactions.
2. the US economy since it is effectively the world's reserve currency.
3. a money supply that is backed by gold.
4. any monetary system where fixed exchange rates operate.

1.17 Which of the following is correct?

1. Child labour rises as national incomes rise.
2. There is no relationship between income and child labour rates.
3. As incomes rise the incidence of child labour tends to fall.
4. Child labour is common in poor countries because parents have more children.

1.18 Which of the following factors will tend to inhibit economic growth?

1. Strong property rights.
2. Being open to international competition via free trade.
3. High levels of corruption.
4. A large population.

1.19 Micro-financing is an attempt to address what problem?

1. The poor lack access to credit as they have no property rights over which to secure a loan.
2. Banks and other lenders charge interest rates that mean the poor cannot afford to take loans.
3. The repayment rate by the poor is so low that traditional lenders go out of business if they make loans to the poor.

4. The poor only want “micro” loans and no bank is prepared to do this.

Level 2 - UNDERSTAND

2.01 Which of the following is correct for a fixed exchange rate?

1. The fixed rate chosen by the Government will be the market equilibrium rate.
2. A fixed rate for the local currency that is too low will lead to excess demand for local currency in the market.
3. An increase in demand for the local currency will push up the value of the exchange rate.
4. Once a country adopts a fixed exchange rate the market is irrelevant.

2.02 Which of the following will shift the demand curve for butter?

1. The price of butter.
2. The cost of milk (used to produce butter).
3. The income of consumers.
4. The cost of farm land.

2.03 The Mercantilist school of thought would lead to what sort of policies?

1. High tariffs on imported goods.
2. Free trade with colonies.
3. An unregulated labour market.
4. Government spending to boost economic growth.

2.04 If the value of the CPI for March 2020 is 1000 then we can conclude

1. that March 2020 is the base period.
2. that there has been no inflation since the base period.
3. that inflation is zero.
4. nothing at all.

2.05 A higher value New Zealand dollar would be welcomed by which group?

1. International students.
2. New Zealanders who borrow from overseas.
3. New Zealanders who own shares in foreign companies.
4. New Zealand farmers.

2.06 Which of the following is true?

1. GDP is a measure of the disposable income of New Zealanders.
2. If exports exceed imports then there will be a current account surplus.
3. If household savings is positive then national savings will be positive.
4. If NFI is negative and X = M then there is a current account deficit.

2.07 If investment for the US exceeds US national savings then

1. the US must have a current account deficit.
2. US Government savings must be negative.
3. the US is a net lender to the rest of the world.
4. interest rates in the US are too low.

2.08 Which of the following would qualify as "investment" in the sense it is used in economics and in the GDP formula C+I+G+X-M?

1. $1000 deposited in the bank.
2. The purchase of shares in a listed company.
3. The purchase of a new truck by a construction company.
4. $1m lent to a US company by a NZ bank.

2.09 If the value of seasonally adjusted house sales rises then

1. either the trend or irregular component has risen.
2. it must be summer when house sales are highest.
3. the actual value of house sales must also have risen.
4. the actual value of house sales must have fallen but by less than usual.

2.10 If New Zealand's terms of trade rises then

1. the value of NZ's exports must have risen.
2. New Zealand can purchase a greater quantity of imports for a given quantity of exports.
3. the quantity of exports must have risen.
4. New Zealand goods and services have become less competitive on the world stage.

2.11 If Japan's inflation rate is higher than the USA's inflation rate then in order for the real exchange rate to be unchanged

1. the nominal value of the yen must fall relative to the $US.
2. the nominal value of the yen must rise relative to the $US.
3. the nominal value of the yen must remain unchanged.
4. the forward exchange rate must fall.

2.12 Which of the following people would be counted in the officially unemployed statistics?

1. Gemma has just left university. She has a part time job in a bank but wants a full time job and is actively seeking one.
2. Tim is currently not working but he is due to start a new job in the next week or so.
3. Samantha was recently made redundant. She doesn't have a job and would take one if offered. She looks at online job sites from time to time.
4. Jesse isn't currently working and is looking for a job as a builder. He has been sending out his CV to building companies and is keen to start.

2.13 A "loosening" of monetary policy is represented in the market for money model by a

1. left shift of the money supply curve.

2. right shift of the money supply curve.
3. left shift of the money demand curve.
4. right shift of the money demand curve.

2.14 The long run aggregate supply curve is vertical because
1. as the price level rises so does real GDP.
2. in the long run the full employment level of GDP is independent of the price level.
3. firms will make their supply decisions without any regard to the domestic price level.
4. the Reserve Bank is the only institution that can print money.

2.15 One of the reasons that a recessionary gap may persist longer than an inflationary gap is that
1. factor prices are sticky downwards but much less so upwards.
2. workers don't realise that there is unemployment.
3. the government responds more quickly to an inflationary gap.
4. the RBNZ will tighten monetary policy for an inflationary gap but can do little for a recessionary gap.

2.16 The long run Philips curve implies that
1. lower unemployment means accepting higher inflation.
2. government policy is ineffective at influencing unemployment or inflation.
3. high inflation and high unemployment are possible.
4. there is no long run trade between inflation and unemployment.

2.17 One of the implications of the standard growth model is that
1. growth rates should not be much different between rich and poor countries.
2. poor countries should be able to grow faster than rich countries.
3. increasing K/L has no impact on growth.
4. GDP is correlated with aspects of quality of life we care about such as child mortality and life expectancy.

2.18 If New Zealand's Gini co-efficient went from 0.2 to 0.4 then this implies that
1. New Zealand incomes are distributed equally across the population.
2. New Zealand incomes have become less equally distributed.
3. average incomes have risen in New Zealand.
4. average New Zealand tax rates have risen.

Level 3 - APPLY

3.01 Which of the following could explain an increase in the price of apples in the New Zealand apple market?
1. A fall in the world price.
2. An increase in wages paid to apple pickers.
3. A decrease in GST.
4. An increase in crop yields due to a great growing season.

3.02 An increase (right shift) in demand for apples and a simultaneous decrease (left shift) in supply of apples means that

1. price definitely increases but the impact on quantity traded is uncertain.
2. price definitely decreases but the impact on quantity traded is uncertain.
3. quantity traded definitely increases but the impact on price is uncertain.
4. quantity traded definitely decreases but the impact on price is uncertain.

3.03 At the start of the year you buy a car for $10,000. At the end of the year it is worth $8,000. If inflation is 10% then the change in the real value of your car is

1. minus 30%.
2. minus 20%.
3. zero.
4. plus 10%.

3.04 Suppose that US$1 = £0.5. If the annual inflation rate in Great Britain is 10% and the inflation rate in the US is 0% then in the next year we would expect the exchange rate to become:

1. US$1 = £0.45.
2. US$1 = £0.5.
3. US$1 = £0.55.
4. US$1 = £1.

3.05 Suppose you wish to purchase a laptop and you have found one on a US web site for US$500 (including shipping). The same laptop in New Zealand is NZ$800. What is the purchasing power parity exchange rate?

1. NZ$1 = US$1.
2. NZ$1 = US$0.75.
3. NZ$1 = US$0.625.
4. NZ$1 = US$0.5.

3.06 Suppose the 12 month deposit rate in Japan is 5%, in the US it is 10% and the spot exchange rate is US$1 = ¥100. What must the forward rate be (to the closest round number)?

1. US$1 = ¥90.
2. US$1 = ¥95.
3. US$1 = ¥100.
4. US$1 = ¥105.

3.07 If real retail sales increase by 5 percent and retail prices decrease by 1 percent then nominal retail sales

1. increase by 6 percent.
2. increase by 4 percent.
3. decrease by 4 percent.
4. decrease by 6 percent.

3.08 Suppose that you know the following information:

Spot exchange rate NZ$1 = US$1

NZ interest rate 10% per annum

US interest rate 8% per annum

What must the 12 month forward rate be (approximately) for there to be no riskless profit?

1. NZ$1 = US$1.02
2. NZ$1 = US$1
3. NZ$1 = US$0.98
4. NZ$1 = US$0.90

3.09 How has the recent global recession affected New Zealand's economic growth and inflation?

1. Higher growth and higher inflation.
2. Higher growth and lower inflation.
3. Lower growth and higher inflation.
4. Lower growth and lower inflation.

APPENDIX 2 BLOOM'S TAXONOMY LEVELS 1 TO 3

Categories & Cognitive Processes	Alternative Names	Definitions & Examples
1. REMEMBER – Retrieve relevant knowledge from long-term memory		
1.1 RECOGNISING	Identifying	Locating knowledge in long-term memory that is consistent with presented material (e.g., Recognize the dates of important events in U.S. history)
1.2 RECALLING	Retrieving	Retrieving relevant knowledge from long-term memory (e.g., Recall the dates of important events in U.S. history)
2. UNDERSTAND – Construct meaning from instructional messages, including oral, written, and graphic communication		
2.1 INTERPRETING	Clarifying, paraphrasing, representing, translating	Changing from one form of representation (e.g. numerical) to another (e.g. verbal) (e.g., Paraphrase important speeches and documents)
2.2 EXEMPLIFYING	Illustrating, instantiating	Finding a specific example or illustration of a concept or principle (e.g., Give examples of various artistic painting styles)
2.3 CLASSIFYING	Categorizing, subsuming	Determining that something belongs to a category (e.g., Classify observed or described cases of mental disorders)
2.4 SUMMARIZING	Abstracting, generalizing	Abstracting a general theme or major point(s) (e.g. Write a short summary of the vent portrayed on a videotape)
2.5 INFERRING	Concluding, extrapolating, interpolating, predicting	Drawing a logical conclusion from presented information (e.g., In learning a foreign language, infer grammatical principles from examples)
2.6 COMPARING	Contrasting, mapping, matching	Detecting correspondences between two ideas, objects, and the like (e.g. Compare historical events to contemporary situations)
2.7 EXPLAINING	Constructing models	Constructing a cause-and-effect model of a system (e.g., explain the causes of important 18th Century events in France)
3. APPLY – Carry out or use a procedure in a given situation		
3.1 EXECUTING	Carrying out	Applying a procedure to a familiar task (e.g., Divide one whole number by another whole number, both with multiple digits)
3.2 IMPLEMENTING	Using	Applying a procedure to an unfamiliar task (e.g., Use Newton's Second Law in situations in which it is appropriate)
4. ANALYZE – Break material into its constituent parts and determine how the parts relate to one another and to an overall structure or purpose		

4.1 DIFFERENTIATING	Discriminating, distinguishing, focusing, selecting	Distinguishing relevant from irrelevant parts or important from unimportant parts of presented material (e.g., Distinguish between relevant and irrelevant numbers in a mathematical word problem)
4.2 ORGANIZING	Finding coherence, integrating, outlining, parsing, structuring	Determining how elements fit or function within a structure (e.g. Structure evidence in a historical description into evidence for and against a particular historical explanation)
4.3 ATTRIBUTING	Deconstructing	Determine a point of view, bias, values, or intent underlying presented material (e.g., Determine the point of view of the author of an essay in terms of his or her political perspective)
5. EVALUATE – Make judgements based on criteria and standards		
5.1 CHECKING	Coordinating, detecting, monitoring, testing	Detecting inconsistencies or fallacies within a process or product; determining whether a process or product has internal consistency; detecting the effectiveness of a procedure as it is being implemented (e.g., Determine if a scientist's conclusions follow from observed data)
5.2 CRITIQUING	Judging	Detecting inconsistencies between a product and external criteria, determining whether a product has external consistency; detecting the appropriateness of a procedure for a given problem (e.g., Judge which of two methods is the best way to solve a given problem)
6. CREATE – Put elements together to form a coherent or functional whole; reorganise elements into a new pattern or structure		
6.1 GENERATING	Hypothesizing	Coming up with alternative hypotheses based on criteria (e.g., Generate hypotheses to account for an observed phenomenon)
6.2 PLANNING	Designing	Devising a procedure for accomplishing some task (e.g., Plan a research paper on a given historical topic)
6.3 PRODUCING	Constructing	Inventing a product (e.g., Build habitats for a specific purpose)

Anderson and Bloom (2001)