

Subject ST5

CMP Upgrade 2016/17

CMP Upgrade

This CMP Upgrade lists all significant changes to the Core Reading and the ActEd material since last year so that you can manually amend your 2016 study material to make it suitable for study for the 2017 exams. It includes replacement pages and additional pages where appropriate. Alternatively, you can buy a full replacement set of up-to-date Course Notes at a significantly reduced price if you have previously bought the full price Course Notes in this subject. Please see our 2017 *Student Brochure* for more details.

This CMP Upgrade contains:

- all major changes to the Syllabus objectives and Core Reading.
- changes to the ActEd Course Notes, Series X Assignments and Question and Answer Bank that will make them suitable for study for the 2017 exams.

1 Changes to the Syllabus objectives and Core Reading

1.1 Syllabus objectives

There have been no changes to the syllabus objectives.

1.2 Core Reading

Chapter 4, section 5

An introduction to this section has been added:

The text of this section is reproduced by kind permission of Kirsty Mackay Fisher, author of the online article “Understanding infrastructure investments” on the CEO Forum Group (Australia) website for general interest only:

<http://www.ceoforum.com.au/article-detail.cfm?cid=6309&t=/Kirsty-MackayFisher-Berkley-Group/Understanding-infrastructure-investments>

Chapter 5, section 1.4

An additional section (section 1.5) has been added after section 1.4. It reads as follows, where the ActEd text and the new core reading are included together:

1.5 Forward Guidance

Forward Guidance is a tool used by some central banks. It enables the central bank to indicate, in the absence of any unforeseen events, how the central bank believes monetary policy will change in the future – usually over the following 18 to 24 months. It is designed to help people see how the central bank sets interest rates and thus should reduce the uncertainty about the future path of monetary policy.

The central bank controls short-term interest rates (here “short-term” means up to a month or so) through its setting of the base rate. The base rate in the UK is the overnight rate set by the central bank at which it will provide liquidity. Forward Guidance allows the central bank to influence long-term interest rates (here longer-term means up to, or slightly beyond, the period of the guidance – so up to perhaps 3 years) by indicating how it expects monetary policy to develop in the future. It also allows the central bank to influence inflation expectations which is also useful.

Forward Guidance is not a guarantee and the central bank can depart from its guidance either as a consequence of some unforeseen economic event or if the economic outlook changes.

Chapter 8, section 2.2

The second paragraph in section 2.2 has been slightly re-worded and now reads as follows:

As an example, the UK's Financial Reporting Council has issued a Corporate Governance Code setting out the principles, structure and processes of good practice in corporate governance as regards accountability, remuneration, stakeholder relationships, board leadership and operational effectiveness.

Chapter 8, section 4

The final paragraph of section 4 has been re-worded to read:

There is also an informal extent to which some investors will favour asset managers who appear more friendly to environmental and ethical objectives whilst making no formal commitments. Following the events of September 11 2001 and other acts of terrorism, many investors debated larger issues such as human rights abuse and its impact on terrorism.

In the UK, Germany, Belgium, France and Sweden, law requires that pension funds state their position on SRI, and similar initiatives are underway in Spain. The EU Commission is considering requiring that all investment funds and financial institutions inform their clients about any ethical or responsible investment criteria they apply or any standards or codes to which they adhere.

Chapter 9, section 2.3

A reference has been added to a paragraph of core reading. The paragraph now reads:

Objectives for the overall fund should not be expressed in terms which have no relationship to the fund's liabilities, such as performance relative to other funds or to a market index.

(see <http://www2.westsussex.gov.uk/ds/cttee/pen/pen270409i3b.pdf>)

Chapter 9, section 3.2

The first paragraph of this section has been re-worded to read:

To address these issues the European Commission launched the Financial Services Action Plan, which culminated in the Markets in Financial Instruments Directive, which consists of a wide range of measures to provide a legal and regulatory environment which supports the integration of EU financial markets. In particular:

The last section of this section is now introduced by the following sentence:

The measures, (which are for background information only for Subject ST5) include:

This means that the list of EU financial market measures is unlikely to be tested.

At the same time, the list has been considerably extended with the following:

- **The Directive on Insider Dealing and Market Manipulation 2003 – to avoid insider dealing and market manipulation by firms by ensuring transparency of reporting.**

Further post-Financial Services Action Plan directives include:

- **Directives concerning audits and accounting requirements (2006)**
- **A Directive regarding independent experts' reports (2007)**
- **Rules regarding the criteria for the prudential assessment of acquisitions and increase of holdings in the financial sector (2007)**
- **A Directive concerning deposit-guarantee schemes (2009)**
- **A Directive regarding the exercise of certain rights of shareholders in listed companies (2007)**
- **A Directive concerning payment services in the internal market (2007)**
- **Various amendments to the Capital Requirements Directive (2009, 2011)**
- **Amendments to the settlement finality Directive (2009)**
- **A Directive regarding disclosure requirements for medium-sized companies and the obligation to draw up consolidated accounts (2009)**
- **A Directive regarding the taking up, pursuit and prudential supervision of the business of electronic money institutions (2009)**
- **A Directive concerning undertakings for collective investment in transferable securities (2009)**

- **A Directive concerning reporting and documentation requirements for mergers and divisions (2009)**
- **A Directive concerning the effective operation of the European System of Financial Supervisors (2010)**
- **A Prospectus Directive (2010)**
- **The Solvency II Directive regarding the taking up and pursuit of the business of insurance and reinsurance (2009)**
- **A Directive regarding alternative investment fund managers (2011)**
- **A Directive revising the Financial Conglomerates Directive (2011).**

Chapter 9, section 5.1

The final paragraph of this section has been re-worded to read:

All listed UK companies, and those in the EU, must use International Financial Reporting Standards for consolidated accounts. (The relevant Core Reading in Subject CT2 reflects the terminology and format from the international standards.)

2 Changes to the ActEd Course Notes

Chapter 4, section 6.2

Beneath the table of commodity types, the ActEd text has been updated to:

Energy contracts are traded on the Intercontinental Exchange (ICE) as well as various other exchanges. Precious metals are traded on the Chicago Mercantile Exchange (CME) for example. Base metals are traded on the London Metal Exchange.

Chapter 4, section 6.3

The number of commodities in the GSCI has been updated to 24.

Chapter 5, section 1.2

The ActEd text at the end of this section has been reworded, and now reads:

In April 2013 three new regulatory bodies were established:

- the Financial Policy Committee (FPC)
- the Prudential Regulation Authority (PRA)
- the Financial Conduct Authority (FCA).

The PRA and the FCA effectively regulate the UK banking sector in a system referred to as “dual regulation”. The FPC focuses on higher-level systemic risks to the financial system.

Chapter 5, section 1.5 (new section)

ActEd have added a self-assessment question on forward guidance:

Question 5.3

Why is this “useful” and who is it “useful” to?

The answer is as follows:

Why is it useful?

Inflation expectations are key to a number of things in the economy, including the strength of the domestic currency and the yield on risk-free long-term bonds. If a central bank believes that the economy would be more stable if the currency is held at a slightly weaker level (for exports for example), then by using forward guidance to forecast low base rates for a long time, it can effectively reduce the attractiveness of the domestic currency. Foreign investors’ demand for the currency will be reduced if they believe that the base rate that they will earn on such an investment will be low for longer.

Likewise, if the central bank believes that bond rates being low in the 2 to 5 year maturity band (for example) would help companies borrow and invest, then forecasting low rates for longer will (through expectation theory) help to reduce 2 to 5 year bond rates.

Who is it useful for?

Primarily the central bank in its carrying out of monetary policy and its manipulation / management of the economy.

It could also be argued that it is useful for investors when making their decisions about which asset category to buy. However, this relies on the belief that the central bank’s forecast is better than the investor’s own, and is not clouded by ulterior motives (like keeping the currency weak!)

3 Changes to the Q&A Bank

There have been no significant changes to the Q&A Bank.

An additional question has been added to Q&A Bank 3. Replacement pages are attached showing the question and the solution.

Also, the solution to Q&A 6.4 has been altered. It now reads as follows:

Q&A 6.4 (ii) Solution

(ii) *Long call and short put on short-term interest rate futures (STIRF)*

An option on a (\$) STIRF gives buyer the right (but no obligation) to buy the reference STIRF contract at a fixed price. Assume:

- it is a European option that can be exercised only at time, t_X , where $t_0 < t_X < t_n$
- the option strike price = S_X
- the futures contract price = $Z(t)$
- the futures contract refers to the future interest rate $f_{t_n, \frac{1}{4}}$ over the period $(t_n, t_{n+\frac{1}{4}})$.

If the investor knows now, at t_0 , that he may want to commit later, at t_X , to lending over that future period $(t_n, t_{n+\frac{1}{4}})$, but wants ensure that he will get a *minimum* return of f_X for any such lending, then he could buy the call option to achieve this. [½]

This is because:

- An investor who owns the call option will exercise the option at time t_X if the future's contract price has risen above the option's strike price, *ie* if $Z(t_X) > S_X$. This will happen if the reference interest rate is then below a certain level – the strike rate f_X , *ie* when $f_{t_X, \frac{1}{4}} < f_X$ where f_X is determined by $(100 - f_X) = S_X$. [1]

- If at t_X the future interest rate ($f_{t_X, 1/4}$) is lower than the strike rate (f_X) the investor could then (at $t_X < t_n$) commit to lend over the future period ($t_n, t_{n+1/4}$) at the then ruling rate (which is expected to be lower than the strike rate), but also exercise the call option to bring his overall return up the strike rate (f_X). [1]
- Conversely, if the actual contract price at the strike date ($Z(t_X)$) is lower than the strike price (S_X), ie the short-term future reference interest rate ($f_{t_X, 1/4}$) turns out to be higher than the strike rate (f_X). In this instance, the investor will expire the option but could still commit to lend over the future period at the then ruling short-term interest rate, on the expectation that this rate will then be higher than the strike rate. [1]

One disadvantage of buying such an option is that money has to be found to fund the option premium. [1/2]

One way of funding this is by selling a put option on a short-term interest rate future at a lower strike S_X^* corresponding to an interest rate f_X^* where $(100 - f_X^*) = S_X^*$. [1/2]

However, although this will generate the put option premium for the investor, it will set an expectation that the *maximum* return from lending over the future time period will be f_X^* . [1]

This is because:

- If the actual contract price at the strike date turns out to be higher than the strike price (ie $Z(t_X) > S_X^*$ because the short-term interest rate $f_{t_X, 1/4}$ is to be lower than that corresponding to the strike price f_X^*), then the put holder will let their option (to sell the STIRF) expire worthless. [1]

- However, suppose that instead the actual contract price at the strike date is lower than the strike price $Z(t_X) < S_X^*$, ie the short-term future interest rate $f_{t_X, 1/4}$ turns out to be higher than f_X^* . In this case, the put holder will exercise their option to sell Z at the strike price. [1]

The investor (the put seller) will then have to pay out on the exercise of the option, but should be lending at a higher rate of interest. [1]

[Maximum 6]

4 **Changes to the X assignments**

The marking schedule for all X Assignments has been changed to bring the assignments into line with the new policy of targeting a pass mark of 60%. This affects most questions in all assignments.

X Assignment Question X4.3(ii)

The solution to this question has been changed and re-worded, and now reads:

(ii)(a) Explain whether the Jensen measure is suitable

The use of beta as a risk measure is appropriate because the equity portfolio is only a “portion” of the total assets of this investor. [1]

Since other parts of the portfolio will exist elsewhere, and diversify away much of the specific risk in the portfolio, only the systematic (undiversifiable) part is important. [1]

(ii)(b) Assess performance using a more suitable measure

Another suitable measure would be the Treynor measure, as this also uses beta and measures proportional risk-adjusted out-performance compared to the security market line, *ie*:

$$T = \frac{R_P - r_f}{\beta_P} \quad [1]$$

For Manager A, this gives:

$$T = \frac{12.4 - 4}{1.2} = 7.0 \quad [1]$$

Whereas for Manager B:

$$T = \frac{9.0 - 4}{0.7} = 7.14 \quad [1]$$

Thus, according to this measure, Manager B performed slightly better, however, the two numbers are too close together to draw any firm conclusions. [1]

[Maximum 4]

5 ***Other tuition services***

In addition to this CMP Upgrade you might find the following services helpful with your study.

5.1 ***Study material***

We offer the following study material in Subject ST5:

- Online Classroom
- Mock Exam
- Additional Mock Pack
- ASET (ActEd Solutions with Exam Technique) and Mini-ASET
- Sound Revision
- Revision Notes
- MyTest
- Flashcards.

For further details on ActEd's study materials, please refer to the 2017 *Student Brochure*, which is available from the ActEd website at **www.ActEd.co.uk**.

5.2 ***Tutorials***

We offer the following tutorials in Subject ST5:

- a set of Regular Tutorials (lasting three full days)
- a Block Tutorial (lasting three full days)
- a Revision Day (lasting one full day).

For further details on ActEd's tutorials, please refer to our latest *Tuition Bulletin*, which is available from the ActEd website at **www.ActEd.co.uk**.

5.3 **Marking**

You can have your attempts at any of our assignments or mock exams marked by ActEd. When marking your scripts, we aim to provide specific advice to improve your chances of success in the exam and to return your scripts as quickly as possible.

For further details on ActEd's marking services, please refer to the 2017 *Student Brochure*, which is available from the ActEd website at www.ActEd.co.uk.

6 *Feedback on the study material*

ActEd is always pleased to get feedback from students about any aspect of our study programmes. Please let us know if you have any specific comments (*eg* about certain sections of the notes or particular questions) or general suggestions about how we can improve the study material. We will incorporate as many of your suggestions as we can when we update the course material each year.

If you have any comments on this course please send them by email to **ST5@bpp.com**.

Question 3.14

An investor believes that US interest rates will start to rise much sooner than the market is currently expecting. The investor notices that the 2-year Eurodollar short interest rate future is trading at $Z = 99.25$ and that the current FRA rate for the period $t = 1$ to $t = 2$ is $0.6\%pa$.

- (i) Describe in detail what the investor could do with these instruments to profit from her belief. [6]

A second investor is intending to speculate on the direction of interest rates in the US over the coming 2 years. He has obtained the following table of Eurodollar short-term interest rate futures quotes:

Eurodollar contract	Quotation	Eurodollar contract	Quotation
3-month contract	99.4	15-month contract	99.0
6-month contract	99.4	18-month contract	98.8
9-month contract	99.3	21-month contract	98.6
12-month contract	99.2	24-month contract	98.4

Volatility of short interest rates: $\sigma = 0.02$.

- (ii) Explain what the investor can deduce from the quotations above about expected interest rates for the coming two years. [1]
- (iii) Calculate the quarterly-compounded forward rate for the 90-day period from 12 months to 15 months from the present time. [5]
- [Total 12]

All study material produced by ActEd is copyright and is sold for the exclusive use of the purchaser. The copyright is owned by Institute and Faculty Education Limited, a subsidiary of the Institute and Faculty of Actuaries.

Unless prior authority is granted by ActEd, you may not hire out, lend, give out, sell, store or transmit electronically or photocopy any part of the study material.

You must take care of your study material to ensure that it is not used or copied by anybody else.

Legal action will be taken if these terms are infringed. In addition, we may seek to take disciplinary action through the profession or through your employer.

These conditions remain in force after you have finished using the course.

So the value of the bond is:

$$10e^{-0.05 \times 5} \Phi(1.8068) + 25 \Phi(-2.3658) = 7.788 \times 0.96460 + 25 \times 0.00885 = 7.734$$

ie approximately £7.734 million.

[2]

[Total 3]

(vi) ***What if the value of the company changed?***

The value of the bond (B_t , say) is $Fe^{-r(T-t)}\Phi(d_2) + V_t\Phi(-d_1)$. The change in this value when the underlying asset changes by a small amount dV_t is given by $\frac{\partial B_t}{\partial V_t}dV_t$.

[½]

Here $\frac{\partial B_t}{\partial V_t}$ is the “delta” for the bond when viewed as a derivative instrument. [½]

As with other Black-Scholes formulae, this delta can be calculated by differentiating the formula ignoring the fact that d_1 and d_2 are actually functions of V_t as well. So we get:

$$\frac{\partial B_t}{\partial V_t} = \Phi(-d_1) = \Phi(-0.23658) = 0.00885 \quad [½]$$

This tells us that the bond value would fall by $0.00885dV_t$.

[½]

[Total 2]

Solution 3.14

(i) ***Profiting from interest rate view***

Short-term interest rate future (STIRF)

Z is defined such that the future short-term interest rate, convertible quarterly is given by $i^{(4)} = 100 - Z$. [½]

So, if the STIRF is currently trading at $Z = 99.25$, then investors believe that the 90-day rate to apply from $t = 2$ to $t = 2.25$ will be $i^{(4)} = 0.75\%$. [½]

If interest rates rise more quickly than the market expects, Z will fall in value ... [½]

... so the investor's strategy should be to sell the STIRF at its current price and aim to profit by buying it back when the price falls. [1]

Each "tick" (0.01 on the price of Z) will earn the investor \$25 in her margin account for every contract sold. [½]

This means that the "tick value" is \$25. [½]

Markers give an equivalent mark to students that point out that the notional size of one contract is $\$10,000[100 - 0.25(100 - Z)]$ [½]

STIRFs are exchange-traded instruments, so the investor would sell the futures through a broker on an exchange. [½]

The contracts would be highly marketable, and could be traded out at any time. [½]

FRAs

An FRA is an "over the counter" instrument, which means that the investor would have to enter into an FRA with a bank or other counterparty. [½]

There would be counterparty risk in uh a trade. [½]

Based on the rate in the question, the investor would enter into an agreement to fix the cost of borrowing between $t = 1$ and $t = 2$ at the current rate of 0.6% *pa*. If rates rise, then the FRA counterparty would pay compensation for the difference between the fixing rate and the actual one-year rate at $t = 1$. [1]

ie $Payoff = (R_x - 0.006) \times L \times 1$, where L is the nominal chosen by the investor, and R_x is the one-year rate that applies at $t = 1$. [½]

The payoff would occur at $t = 2$. [½]

The FRA would not be marketable, so the investor would probably have to hold it until maturity. [½]

With both of these contracts, because they are obligations, if interest rates move in the wrong direction the investor will suffer losses in her margin account (STIRF) or require to pay the counterparty (FRA) at the expiry of the contract. [1]

[Maximum 6]

(ii) ***Eurodollar contract***

Because Z is defined such that the future short-term interest rate, convertible quarterly is given by $i^{(4)} = 100 - Z$, the investor can deduce that expected interest rates for the coming two years in the US range from $i^{(4)} = 0.6\%$ in 3 months' time to $i^{(4)} = 1.6\%$ in 2 years' time. [1]

These rates $i^{(4)}$, are annual, quarterly-compounded rates of interest, and each applies to a 90-day period. [1/2]

[Maximum 1]

(iii) ***Quarterly-compounded forward rate***

The forward rate can be calculated from the equation:

$$\text{Forward rate} = \text{Futures rate} - \frac{1}{2}\sigma^2 t_1 t_2 \quad [1]$$

where:

- $t_1 = 1$ is the time (in years) to maturity of the futures contract. [1/2]
- $t_2 = 1.25$ is the time (in years) to maturity of the rate underlying the futures contract. [1/2]
- $\sigma = 0.02$ is the standard deviation of the change in the short-term interest rate in one year. [1/2]
- the forward rate and futures rate in this equation are both forces of interest. [1/2]

The appropriate Eurodollar quotation is the 12-month contract, which implies a future rate of $i^{(4)} = 0.8\%$. [1/2]

This equates to a continuously-compounded rate of:

$$r = \ln\left(1 + \frac{0.008}{4}\right)^4 = 0.7992\% \quad [1/2]$$

So, the continuously-compounded forward rate is:

$$0.007992 - \frac{0.02^2}{2} \times 1 \times 1.25 = 0.0077420 \quad [1]$$

Converting back to the quarterly-compounded rate, the forward rate is:

$$i^{(4)} = 4\left(e^{0.0077420/4} - 1\right) = 0.77495\% \quad \left[\frac{1}{2}\right]$$

This would be the rate available on a forward contract that does not involve a margin account, such as an FRA. [$\frac{1}{2}$]

[Maximum 5]