

Appendix 1: Our approach and analysis of the costs and risks of different credit and collateral arrangements

This appendix provides details of the analysis we have undertaken including our overall approach and in particular the assumptions and calculations undertaken.

To identify the appropriate balance of risk, we have assessed the impact of the proposed credit arrangements, including an assessment of

- **working capital;**
- **collateral;** and
- **the impact on the wholesaler of a major retailer default.**

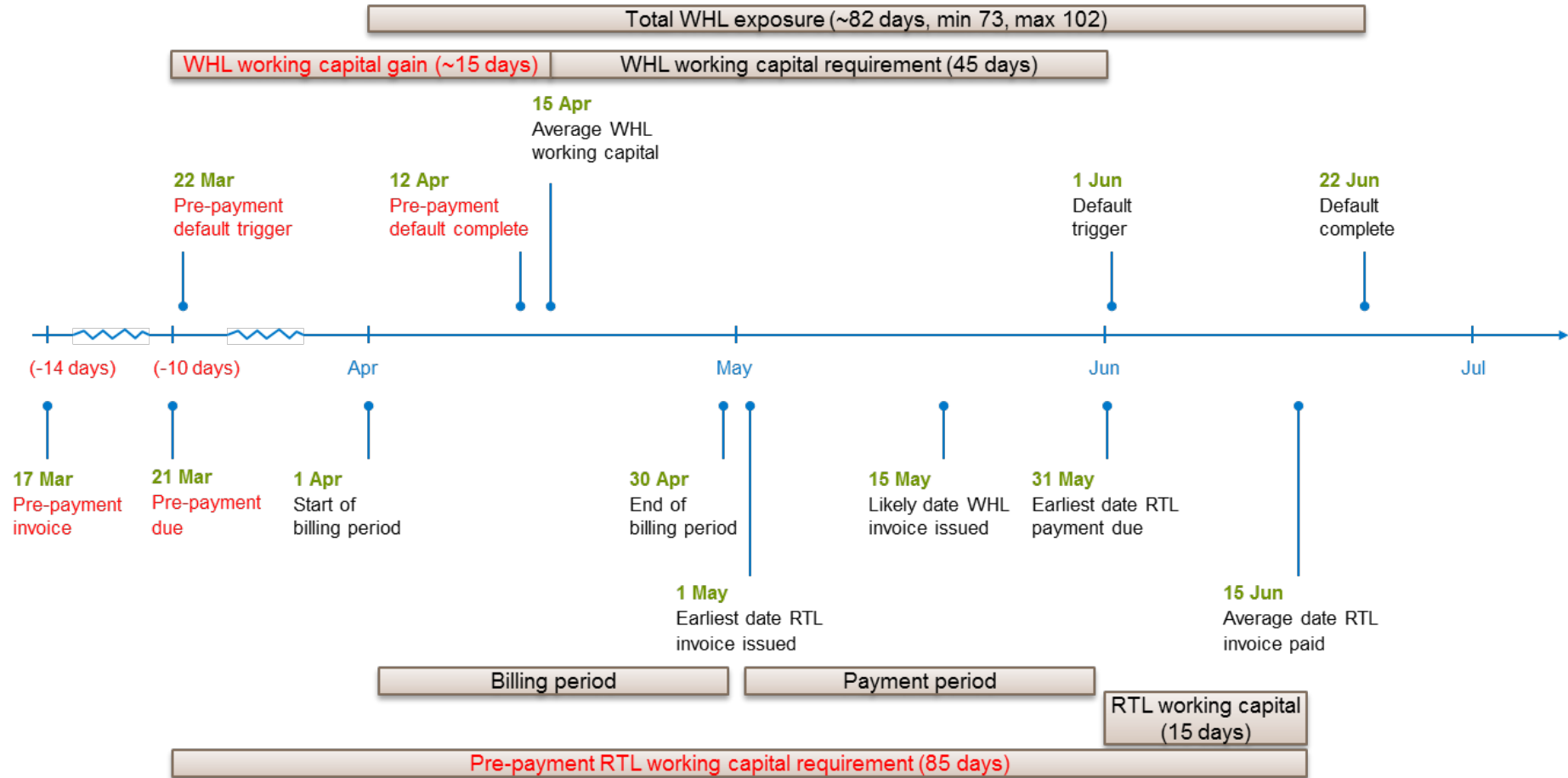
Each of these impacts is largely dependent on the payment timescales between the parties and the working capital and level of collateral provided by the retailer under any selected credit option.

1. Payment timescales

The impact of different credit proposals will depend on the length of time between when the retailer pays the wholesaler in relation to the billing period. The timescales are different largely depending on which of the settlement arrangements are being used- pre-payment or post-payment.

Figure A1.1 shows two sets of timings – timings relating to **pre-payment** (where the retailer (RTL) pays the wholesaler (WHL) in advance of receiving supply) are shown in red; timings relating to **payment in arrears** (where the retailer pays the wholesaler after receiving supply) are shown in black. Calendar dates are used for ease of presentation, but most of the day totals are actually expressed as **business days**, so the timeline should be interpreted with this in mind.

Figure A1.1: Assumed payment timescales for credit analysis based on proposed settlement and interim supply arrangement



We have developed the payment timescales based on the timescales for billing and payment that are already established in the draft Wholesale Retail Code (**WRC**) and the draft Market Arrangements Code (**MAC**). We have also considered the timescales and arrangements established in the **Interim Supply Code** to understand the full potential exposure to the wholesaler under different options and the corresponding costs on the retailer. The analysis also includes assumptions about when retailers are likely to be paid by end customers as this is a key factor that will affect cash-flows and the corresponding need for working capital or collateral cover. Figure A1.2 provides some illustrative examples of the assumed timescales.

Figure A1.2: Illustration of timings used in our analysis (as per figure A1.1)

<p>Payment in arrears - where no default occurs</p>	<ul style="list-style-type: none"> On 1 April the wholesaler commences supply for one calendar month. This ends on 30 April and is referred to as the billing period. At this stage, the wholesaler faces 30 calendar days of “exposure” to the risk of the retailer not paying. After the end of the billing period, the wholesaler issues an invoice to the retailer. It is assumed that this happens, on average, by 15 May (as implied in the WRC). The retailer pays the wholesaler by 31 May (the time from the end of the billing period to 31 May is referred to as the payment period). By this stage, the wholesaler faces 60 calendar days of exposure. Meanwhile, it is assumed that the earliest time a retailer issues an invoice to an end customer is 1 May (the day after the end of the billing period). The end customer pays the retailer, on average, on 15 June. The average days it takes an end customer to pay the retailer is assumed as 45 days (this is based on the calculations used for PR14, taking into account the fact that customer debtor days vary, and some customers are unmetered and pre-pay). The retailer must therefore fund 15 days of working capital (from the date it pays the wholesaler to the date it receives payment from the end customer).
<p>Payment in arrears - where default occurs</p>	<ul style="list-style-type: none"> A default trigger occurs on 1 June if the retailer has not paid by 31 May. The retailer is then in default if it does not pay by 22 June. The WRC allows the retailer a maximum of 21 calendar days (15 business days) to pay after the due date. At this stage, the wholesaler faces 82 calendar days of exposure. Once the retailer is in default, it is assumed that the Interim Supply process commences and at that point the liability for the wholesale service passes to the incoming retailer following a successful allocation process.

<p>Pre-payment – where no default occurs</p>	<ul style="list-style-type: none"> • On 17 March, the wholesaler issues an invoice to the retailer for supply for the following calendar month. • The retailer pays the wholesaler, in advance, by 21 March. • The wholesaler provides supply from 1 to 30 April. This is referred to as the billing period. • Meanwhile, it is assumed that the earliest time a retailer issues an invoice to an end customer is 1 May (the day after the end of the billing period). • The end customer pays the retailer, on average, on 15 June. The average days it takes to pay the retailer is thus assumed as 45 days (based on the calculations used for PR14, taking into account the fact that customer debtor days vary, and some customers are unmetered and pre-pay). The retailer must therefore fund 85 days of working capital (from the date it pays the wholesaler to the date it receives payment from the end customer).
<p>Pre-payment – where default occurs</p>	<ul style="list-style-type: none"> • A default trigger occurs on 22 March if the retailer has not paid by 21 March. • The retailer is then in default if it does not pay by 12 April. The WRC allows the retailer a maximum of 21 calendar days (15 business days) to pay after the due date. At this stage, the wholesaler faces 12 calendar days of exposure. • Once the retailer is in default, it is assumed that the Interim Supply process commences and at that point the liability for the wholesale service passes to the incoming interim retailer following a successful allocation process.

Figure A1.3 provides further details of the assumptions underpinning the payment timescales and how and where they have been derived from. We welcome comments from stakeholders on our approach to the analysis and the assumptions can calculations made.

Figure A1.3: Explanation of assumed payment timescales

Event	Explanation	Reference
<p>Pre-payment invoice</p>	<p>Invoice issued by wholesaler to retailer under pre-payment by 14 business days before the start of the relevant month</p>	<p>Business Terms 9.2.3 (b)</p>
<p>Pre-payment due</p>	<p>Payment of pre-payment invoice by retailer to wholesaler by 10 business days before the start of the relevant month</p>	<p>Business Terms 9.2.3 (c)</p>
<p>Pre-payment Retail (RTL) working capital requirement</p>	<p>Period during which retailer needs to fund working capital under pre-payment</p>	<p>Sum of days between Pre-payment due date and Average date RTL invoice paid date</p>

Event	Explanation	Reference
Pre-payment Wholesale (WHL) working capital gain	Period during which wholesaler receives working capital benefit of retail pre-payment	Sum of days between Pre-payment due date and Average WHL working capital
Pre-payment default trigger	Date on which retailer is technically in default if payment has not been made by the prior business day (or another defined default event has occurred under Part E Section 10 of Business Terms), under pre-payment	Business Terms 9.2.3 (c), Part E Section 10
Start of billing period	First day of billing period of one calendar month	Wholesale-Retail Code Part 4
Billing period	Period during which wholesaler provides supply to retailer	Sum of days from Start of billing period to End of billing period (equal to one calendar month)
Total WHL exposure	Period during which wholesaler is exposed to risk of retailer default	Sum of days between Start of billing period and Default complete
Pre-payment default complete	Latest possible date on which it is assumed liability has passed to a new retailer ("Date of Relevant Cessation of Supply"), following classification of existing retailer as a Defaulting Trading Party if payment was not made more than 15 business days (22 calendar days) after the due date under pre-payment	Interim supply arrangements, Business Terms 10.1.1 (a)
Average WHL working capital	During the billing period, the wholesaler will provide supply to the retailer, which will generate a working capital cost for the wholesaler under payment in arrears; however, the full working capital requirement does not apply from day 1 of the billing period, therefore the mid-point of the month is taken as it represents the average point	Mid-point of billing period of one calendar month
WHL working capital requirement	Period during which wholesaler needs to fund working capital (NB: under pre-payment, wholesaler accrues a working capital benefit) (does not include any working capital during period from Default trigger to Default complete)	Sum of days between Average WHL working capital and Earliest date RTL payment due
End of billing period	Last day of billing period of one calendar month	Wholesale-Retail Code Part 4
Earliest date RTL invoice issued	Earliest date on which retailer could issue an invoice to a customer that requires consumption data to be available to retailer – in practice, retailers may invoice some time after this, and the retailer plays a role in deciding when to invoice based on negotiations with customers;	

Event	Explanation	Reference
	the date on which the retailer will be paid by customer will be on average 45 days after this	
Payment period	Period during which wholesaler issues invoice to retailer	Business Terms 9.2.4 (b) - sum of days from Earliest date RTL invoice issued to Earliest date RTL payment due
Likely date WHL invoice issued	The date on which the wholesaler is assumed, on average, to issue an invoice to the retailer for the prior billing period under payment in arrears	Business Terms 9.2.4 (b)
Earliest date RTL payment due	Earliest date on which a retailer is required to pay wholesale invoice under payment in arrears (being the later of 30 days after end of billing period or 15 days after invoice received from wholesaler)	Business Terms 9.2.4 (c)
Default trigger	Date on which retailer is technically in default if payment has not been made by the prior business day (or another defined default event has occurred under Part E Section 10 of Business Terms), under payment in arrears	Business Terms 9.2.4 (c), Part E Section 10
RTL working capital requirement	Period during which retailer needs to fund working capital under payment in arrears	Sum of days between Earliest date RTL payment due and Average date RTL invoice paid date
Average date RTL invoice paid	Date that retailer receives payment from customer, on average	PR14 average debtor days assumption (45 days from end of billing period)
Default complete	Latest possible date on which it is assumed liability has passed to a new retailer ("Date of Relevant Cessation of Supply"), following classification of existing retailer as a Defaulting Trading Party if payment was not made more than 15 business days (22 calendar days) after the due date under pre-payment	Interim supply arrangements, Business Terms 10.1.1 (a)

2. The financial impact on retailers and wholesalers of different credit options

The financial impacts on retailers and wholesalers can be categorised as follows:

Wholesale (W)	<ul style="list-style-type: none"> 1 – Potential bad debt exposure in the case of retailer default 2 – Working capital costs
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Retail (R)

- 1 – Costs of collateral
- 2 – Working capital costs

The financial impacts will depend on the payment timescales, as set out above, and the level of collateral. The level of collateral required under any credit arrangement can be considered in terms of the percentage of the total exposure that the wholesaler may face in the event of retailer default. For example, if the up-front collateral provided by the retailer equates to 100% of the total charges that it has incurred, then in the event of default the wholesaler will not have incurred any increased debt.

However, if the level of collateral required only covers 50% of the total exposure then the wholesaler will face a residual risk in the case of default depending on the extent to which it can settle the debt via an administrator. The cost (to the retailer) of that collateral will then vary depending on the form of credit through which it is provided.

Impact of credit on wholesale revenues and net margins

The following analysis sets out the detailed financial impacts on retailers and wholesalers of different credit options. The **wholesaler costs** are expressed as a percentage of total wholesale non-household revenues (%) and the **retailer costs** are expressed as impact on default retail margins in basis points (bps).

The analysis is provided for two different levels of collateral coverage, between one calendar month (i.e. a single billing period) (**Figure A1.4**) and 100% of the potential exposure, assumed at 82 days (**Figure A1.5**). The key assumptions underpinning this analysis are then set out in **Figure A1.6**, with further detail in **Figure A1.7**.

Figure A1.4: Financial impacts on wholesalers and retailers: Retailer credit coverage provided for a billing period (1 calendar month)

Option	Impacts on wholesaler			Impacts on retailer		
	W1 (a) Potential exposure of wholesaler (% of total wholesale revenues from retailer)	W1 (b) & (c) Adjusted exposure of wholesaler (% of total wholesale revenues from retailer)	W2 Cost of working capital to wholesaler (% of total wholesaler revenues from retailer)	R2 Cost of credit (Margin impact expressed as reduction against 2.5% retail net margin)	R1 Working capital (margin impact expressed as reduction against 2.5% retail net margin)	R1+R2 Total impact
Cash	9.6%	0.5% - 0.2%	0.4 – 0.5%	31 bps – 61 bps	13 bps – 26 bps	44 bps – 87 bps

Letter of credit	10%	0.5% - 0.2%		31 bps – 61 bps		44 bps – 87 bps
Guarantee	10%	0.5% - 0.2%		23 bps – 46 bps		36 bps – 72 bps
Insurance	11.2%	0.5% - 0.2%		38 bps-77 bps		51 bps – 103 bps
Unsecured credit	17.8%	0.9% – 0.4%		0 bps		13 bps – 26 bps
Pre-payment	0.0%	0.0%	-0.2 - 0.3%	0 bps	81 bps-162 bps	81 bps – 162 bps

Figure A1.5: Financial impacts on wholesalers and retailers: Retailer credit coverage provided for 100% of potential wholesale exposure 82 days

Option	Impacts on wholesaler			Impacts on retailer		
	W1 (a) Potential exposure of wholesaler (% of total wholesale revenues from retailer)	W1 (b) & (c) Adjusted exposure of wholesaler (% of total wholesale revenues from retailer)	W2 Cost of working capital to wholesaler (% of total wholesaler revenues from retailer)	R2 Cost of credit (Margin impact expressed as reduction against 2.5% retail net margin)	R1 Working capital (margin impact expressed as reduction against 2.5% retail net margin)	R1+R2 Total impact
Cash	0.0%	0.0%		61 bps – 84 bps		97 bps – 110 bps
Letter of credit	0.0%	0.0%		61 bps – 84 bps		97 bps – 110 bps
Guarantee	0.0%	0.0%	0.4% - 0.5%	46 bps – 63 bps	13 bps – 26 bps	97 bps – 89 bps
Insurance	0.1%	0.0%		77 bps – 105 bps		97 bps – 131 bps
Unsecured credit	22.5%	1.1% - 0.6%		0 bps		13 bps – 26 bps
Pre-payment	3.3%	0.2%-0.1%	-0.3%	0 bps	92 bps – 162 bps	93 bps – 162 bps

The key assumptions underpinning the financial impact analysis are set out in Figure A 1.6.

Figure A1.6: Key assumptions underpinning financial impact analysis

Column	Explanation
W1 (a)	Assumes 100% of wholesale revenue is impacted by the default event
W1 (b)	The potential risk exposure is reduced to reflect the risk of default. W1 (b) assumes 1 in 20 probability of default on 100% of total non-household revenues to wholesaler

Column	Explanation
	W1 (c) assumes 1 in 20 probability of default on 50% of total non-household revenues to wholesaler
W2	Range in working capital for wholesaler is generated from using a cost of capital equal to the cost of debt and the full weighted average cost of capital.
Retail margin	Retail margin range reflects ranges in cost of credit under each option and range in retail working capital from 4-8% (these are illustrative upper end assumptions rather than a true range of expectations: 4% assumes debt-funded working capital and is at the top end of bank guidance of Libor + 100-300 bps; 8% assumes equity-funded working capital)

For **wholesalers** the impact depends on the degree of collateral provided, the risk of default and the proportion of wholesale revenues exposed to the retailer that defaults.

Figure A1.4 shows the impact if credit is provided for 1 billing period. Column W1 (a) shows the potential impact where 100% of a wholesaler's revenues from non-household were at risk of retailer default, for example if a wholesaler's entire revenue base was exposed to a single retailer and that the collateral had failed completely. This column makes no adjustment to reflect the risk of retailer default. This shows that the potential costs to the wholesaler could be significant at between 10-18% of total non-household revenues (depending on which credit option is in place).

Column W1 (b) shows the impact on wholesalers adjusting for the risk of default (assumed as 1 in 20 event) and the level of wholesaler revenue exposed to a retailer default (100% or 50%, taking into account that a wholesaler might provide services to a number of different retailers). The 1 in 20 probability of default is based on the average impacts of defaults in Scotland (0.08%) and UK energy (0.02%) and the UK insolvency rate of ~0.5%.

Where the retailer provides collateral of one month then this shows that the wholesale revenue risk exposure is between 0.2% and 0.9% for the post payment options (as set out in figure A1.4). Where the collateral provided covers the total period of 82 days then the total debt exposure for wholesalers is likely to be minimal for all apart from the unsecured debt option (which by definition does not provide collateral), see Figure A1.5.

The working capital impact on wholesalers is minimal, at <1% (depending on the cost of working capital assumptions used). Under a pre-payment option, there is a

small working capital benefit to wholesalers (<1%). The key assumptions are set out in Figure A1.6.

For **retailers**, the cost of collateral has an impact on retail margins in the range of 23-105 bps, depending on the level of cover required (from one billing period to 100% of the total debt exposure experienced by wholesalers). For unsecured credit and pre-payment options, this cost is zero.

Under all of the options (excluding pre-payment), the working capital cost on retailers generates a reduction in the net margin of between 13-26 bps, depending on the cost of capital (which is assumed between 4% and 8%). For pre-payment, the impact is more significant at 81-162 bps, again varying according to the assumed cost of capital.

The total impact on retail margin therefore shows significant variation, between 13-131 bps depending on the credit option, level of collateral provided up-front and assumed retail cost of capital.

Impact of credit terms on net margins by volume band

The following assesses the impact of credit on net margins for different volume bands.

The highest net margin is 6.5% (for several volume bands lying between 0MI and 1MI). Assuming the worst case scenario of a retailer providing 82 days of cover using the insurance option, a 131 bps reduction in margin would leave the retailer with a net margin of 5.19%.

The lowest net margin is 0.7% (for several volume bands lying between 100MI and >1000MI). Assuming the worst case scenario of a retailer providing 82 days of cover using the insurance option, a 131 bps reduction in margin would leave the retailer with a net margin of negative 0.61%. In fact, under this worst case scenario, any margin lower than 1.31% would leave a retailer with a negative margin (this would apply to approximately 37% of tariff bands by number – not consumption – and disproportionately affect larger customers, which generally have smaller net margins).

The analysis shows that the range of impacts on **both retailers and wholesalers** varies by up to 118bps and 23% respectively, depending on the assumptions used to inform the analysis, suggesting a high degree of uncertainty over the likely impacts. A key sensitivity in the analysis is the level of collateral provided by the retailer, which could reduce the impacts on wholesalers by 60%. Where a retailer provided

100% of the total debt exposure to wholesalers as collateral, the impact on a wholesaler appears to be minimal.

Only in the case of an extreme event does it appear there could be a more material impact on a wholesaler (5.4% of total revenues under the most extreme case where there is no collateral). For retailers, there could be impacts from a reduction in net margin associated with the costs of collateral and working capital (although the unsecured credit option could give rise to minimal impacts).

The analysis demonstrates the impact of the level of collateral provided by retailers in terms on the total bad debt exposure to wholesalers. Clearly, the higher the level of collateral provided by retailers, the smaller the risk of debt exposure is to wholesalers. However, the impact of retailers providing a higher level of collateral is a significant deterioration in margin, which may discourage new entry and impair market development.

Both retailers and wholesalers have expressed concerns about the level of collateral coverage that should be provided by retailers. It is evident that striking an appropriate balance will be difficult. These concerns have led some stakeholders to consider whether other regulatory mechanisms (e.g. sharing of wholesaler risks) could be introduced to supplement the proposed credit options.

Further analysis suggests there could be a set of arrangements in which the impacts on wholesalers and retailers are reasonably balanced. To evaluate this, we have considered three scenarios based on the net margins applying to volume bands: one with the highest net margin of 6.5% (“high”), one with the highest average margin allowed of 2.5% (“average”), and one with the lowest net margin of 0.7% (“low”).

For each scenario, we consider (a) the impact on retailers of reduction in net margin, and (b) the impact on wholesalers of default, of variations in the following:

<p>Key calculation assumptions</p>	<p>a – cost of credit to retailer b – timescales for default and interim supply</p>
<p>The amount of risk covered by the credit arrangements and the amount covered by risk sharing</p>	<p>a – no risk sharing (100% of cover provided by credit options); b - 60% of cover provided by credit options and 40% of cover provided by risk sharing.</p>

Figure A1.7: Key assumptions underpinning financial impact analysis

Key dimension	Assumption	Rationale
Period of analysis	12 months	An annual period assists ease of comparison as analysis is commonly carried out on an annual basis
Billing period	1 calendar month	Conforms to the implied definition in WRC Part 4 (the relevant days specified under the invoice period add up to one calendar month)
Annualised costs	Annual costs incurred by the retailer or wholesaler under the credit arrangement options	Consistent with the annual period of analysis
Net retail margin	2.5% net EBIT margin	Conforms to the definition used by Ofwat for PR14
Period of time required to invoke interim supply (default period)	21 calendar days	Allows time for wholesalers to confirm retailer's intentions associated with outstanding payment and to complete the default process
Timescales for analysis of credit and default risk in arrears	82 calendar days	Billing period of 1 calendar month, settlement period of 30 days and a default/ISC period of 22 days (i.e. $30 + 30 + 22 =$ maximum exposure of 82 days of revenue at risk, as in codes)
Payment terms for payment in advance between retail and wholesale	12 calendar days	-10 days for retailer to pay wholesaler, 22 days for default/ISC (i.e. $-10 + 22 =$ maximum exposure of 12 days of wholesale revenue at risk, as per codes)
Payment terms between retailers and customers	45 calendar days	Consistent with Ofwat's estimated industry average used for PR14; assumes retailers collect revenue from customers 45 days after services received
Wholesale revenues	93% of the total customer bill	Calculated based on PR14 FD amounts for total industry (values rounded to one decimal place)
Wholesale cost of working capital	3% nominal	Based on industry cost of new debt at PR14 of 2.0% plus inflation of 1%
Retail cost of working capital	4% nominal	Based on full debt financing with assumed costs of debt at 300bps above one-year LIBOR of 1% (assuming inflation of 1%)
Sensitivity on retail cost of working capital	8% nominal	Assumes all equity financing and based on real cost of capital for a range of retailers with inflation of 1% included
Annualised retail default cost exposure to wholesaler	Based on reducing the net wholesale debt exposure by the probability of retailer default	Retailer default is assumed to be a 1 in 20 event (taking Scotland and UK energy as points of reference)

Total default exposure	1 default in 12 month period (base case); 1 default in 20 (sensitivity)	Wholesalers could be at risk from multiple defaults, but a single default is considered for purposes of the analysis (considering current average UK company insolvency/liquidation rate of 0.5%)
Payment terms for payment in arrears between retail and wholesale	30 days	Consistent with WRC
Payment terms for payment in advance between retail and wholesale	-10 days	Consistent with Business Terms
Credit coverage	Credit support arrangements assume either the billing period (for pre-payment) or 82 days is covered (for all payment in arrears credit options)	Simplifying assumption reflecting maximum risk exposure to wholesalers based on billing, payment and default timings in Wholesale Retail Code and draft Interim Supply arrangements
Billing forecast accuracy	Billing forecast accuracy based on historic consumption is 100% accurate	Simplifying assumption; actual results may vary and should be factored into consideration of proposed arrangements
Recovery rate	Percentage rate as indicated for each option	Assumes that a range of factors might prevent the wholesaler recovering the full amount covered by the credit arrangements should default occur (e.g. cash on deposit being less than required amount because of forecast inaccuracy; bank/parent default in relation to letter of credit/PCG; refusal of claim in case of insurance etc.)
Timing of recovery	Days/months as indicated for each option	Assumes there is a minimum timeframe for the wholesaler to receive funds in the event of retailer default (e.g. wholesaler may need to lodge paperwork/register a claim, provider of collateral may need to evaluate and process claim/arrange transfer of funds etc.)
Credit costs	Costs (percentages, cash amounts etc.) as indicated for each option	Assumes retailer will incur costs for obtaining collateral under particular options; the costs may be a mixture of up-front and ongoing fees; there may also be further transaction fees not included, e.g. for renewing financial instruments (these will depend on how often the retailer has to renew the collateral)
Working capital costs	Costs (percentages, cash amounts etc.) of funding	Assumes retailer incurs working capital costs because of timings between when it must pay

	required working capital as indicated for each option	wholesalers and when it is paid by end customers under every scenario; retailer is also assumed to incur working capital costs in addition to this for pre-payment option; wholesaler is assumed to incur working capital costs as a result of timings between when it is paid by retailer and when it incurs costs for providing supply under all options except pre-payment (in this case, wholesaler is assumed to incur a working capital gain as a result of being paid by retailer before providing supply)
Collateral threshold	10% above or below current required level of collateral	Assumes retailer must post additional collateral (via its choice of option) should the current collateral be 10% less of the new requirement; conversely, if the required collateral falls by 10% or more of the current level, the retailer is entitled to reduce its collateral
Collateral timing	Additional collateral to be posted within 10 working days	Assumes that, should a retailer be required to post more collateral or move to another option, this will take place within 10 working days of the requirement arising