ASSESSMENT OF THE ASSET BETA FOR FONTERRA'S NOTIONAL BUSINESS

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EXECUTIVE SUMMARY

I have been asked to review a beta estimate for Fonterra's Notional Business, appropriate allowances for certain additional risks relating to that business, and to assess a further generic question about betas. My conclusions are as follows.

Firstly, in respect of the asset beta for Fonterra's Notional Business, Marsden estimates this at 0.375, primarily on the basis that this business is similar to regulated Electricity Lines Businesses (ELBs) and the latter warrant an asset beta at this level. However the regulatory regimes for these two types of businesses are quite different and Marsden does not address this problem. Nevertheless, the asset beta of Fonterra's Notional Business would differ from that of a revenue-capped firm operating in the normal fashion (by purchasing milk in arms-length transactions from unrelated suppliers) only in that Fonterra's Notional Business would not face risk from payments for milk, the corresponding revenue-capped firm would face this risk, the beta risk to the latter firm arising from the payments for milk would reduce its beta, and therefore the beta of Fonterra's Notional Business would be at least that of a revenue-capped firm operating in the normal fashion. In turn, the appropriate asset beta of a revenue-capped business should not exceed that of a price-capped firm, and the Commission estimates the latter at 0.34 for ELBs. So the appropriate asset beta for Fonterra's Notional Business should then be 0.34, less a deduction for demand risk to obtain an appropriate beta for a revenue-capped business operating in the normal fashion, plus an increment for the deletion of the risk from payments for milk. Since the empirical evidence on the question of whether revenue-capped businesses have lower betas than price-capped businesses is inconclusive, and therefore the beta for ELBs should also be applied to revenue-capped businesses, consistency points to the same treatment for the adjustment for milk price risk. Accordingly, the estimated asset beta for Fonterra's Notional Business is 0.34.

Secondly, in respect of the possibility of asset stranding (removal of assets from the base used to determine the efficient non-milk costs of the business), Marsden estimates the WACC compensation that would be required to Fonterra for this possibility at up to 0.2%, with the extreme case arising from a 5% probability of stranding and 12.5% of the assets being stranded in that event. I concur with Marsden's theoretical analysis. However, Marsden was unable to provide any empirical or other evidence in support of the maximum values for these two underlying parameters, and therefore favoured no WACC adjustment. Conditional on

the absence of suitable empirical data, I concur with this conclusion. Furthermore, the conclusion is strengthened by the fact that the WACC adjustment is so small even with a moderate probability of stranding and a moderate proportion of the assets being stranded in that event.

Thirdly, in respect of whether the beta of a business is affected by the scale of its operations, the answer is no. This occurs because the only part of beta that involves the business in question is its rate of return and the rate of return on an asset is unaffected by the scale of its operations.

1. Introduction

In respect of the milk supplied to it, Fonterra pays an amount equal to the revenues it would earn from processing that milk into specific commodities (RCPs) and selling them at specific (GDT) prices, less the efficient costs of such processing including the cost of capital, in accordance with the Milk Price Manual (Fonterra, 2012). This calculation requires an estimate of the cost of capital of a business acting in this way, and therefore an estimate of the asset beta of such a business (the "Fonterra Notional Business"). Marsden (2016) estimates the beta for the Fonterra Notional Business and assesses the appropriate allowances for certain additional risks relating to that business. This paper reviews Marsden's report.

2. The Beta for the Notional Business

Marsden (2016, section 2) considers two versions of the Notional Business. The first he designates the "Milk Price Manual Purely Notional Business". Letting REV_1 denote the revenues of a business that is solely engaged in processing the milk received by Fonterra into RCPs and selling it at GDT prices, $EOTH_1$ the efficient costs of such activities other than the purchase price of the milk, and MIL_1 the purchase price of the milk that was processed (REV_1 net of $EOTH_1$), the net cash flow of the "Purely Notional Business" is as follows:

$$\begin{aligned} NCF_P &= REV_1 - MIL_1 - EOTH_1 \\ &= REV_1 - (REV_1 - EOTH_1) - EOTH_1 \\ &= 0 \end{aligned} \qquad (1)$$

I do not agree with this analysis. The Notional Business described in section 1 must be a business that could actually exist, and therefore it must incur the *actual* rather than the efficient non-milk cost of processing the milk it receives. This does not correspond to equation (1). The efficient non-milk costs are merely a component of the milk price payment. The only business that would correspond to equation (1) would be one in which the non-milk costs incurred were the efficient costs determined in accordance with the Manual. So, inter alia, all of its actual labour costs would have to be determined in such a fashion. Clearly, there is no such business nor could there be.

Marsden's second version is designated the "Notional Business". Letting REV_2 denote the revenues of a business that is solely engaged in processing the milk received by Fonterra into RCPs and selling it at a mixture of GDT and other prices, and OTH_1 the actual costs of such activities other than the purchase price of the milk, the net cash flow of the "Notional Business" is as follows:

$$\begin{aligned} NCF_N &= REV_2 - MIL_1 - OTH_1 \\ &= REV_2 - (REV_1 - EOTH_1) - OTH_1 \\ &= (REV_2 - REV_1) + (EOTH_1 - OTH_1) \end{aligned} \quad (2)$$

So, relative to the "Milk Price Manual Purely Notional Business", the "Notional Business" faces price risk arising from off GDT prices and cost risk arising from the difference between actual and efficient costs (Marsden, 2016, para E.5). Marsden clearly intends that this business would exercise some discretion in choosing whether to sell at GDT or non-GDT prices, including recourse to longer dated contracts. Such a business could exist but the price risk arising here might change the asset beta and therefore affect the milk price paid in accordance with the Milk Price Manual. However, the clear intent of that Manual is to remove Fonterra's control over the milk price, and therefore to remove Fonterra's control over the asset beta. Thus, the price risk shown in equation (2) could not exist for the Notional Business, and therefore it would have to be selling all output at GDT prices (as well as such prices being used for the purposes of determining the milk payment). The only risk faced by this business is the cost risk and solely in relation to non-milk costs incurred in processing milk into RCPs. Accordingly, its net cash flows would be as follows:

$$\begin{aligned} NCF_{NF} &= REV_1 - MIL_1 - OTH_1 \\ &= REV_1 - (REV_1 - EOTH_1) - OTH_1 \\ &= EOTH_1 - OTH_1 \end{aligned} \quad (3)$$

In respect of the price risk shown in equation (2), Marsden (2016, section 3) regresses the difference between on and off GDT prices for RCPs against the NZX50 for the 2013-2016 period, and finds no statistically significant relationship. So, for the purposes of estimating beta, there is therefore no difference between equations (2) and (3).

In respect of growth options for the Notional Business, Marsden (2016, section 3) argues that any output expansion would be likely to be sold at GDT prices, and therefore the beta impact of the growth option would be small. In fact, in respect of the Notional Business described in equation (3), any output expansion would necessarily be sold at GDT prices and therefore there would be no beta impact from possible output expansion.

Marsden (2016, section 4) argues that interest-free loans loans made by Fonterra to its farmer suppliers when the milk payout per kgMS is low mildly increases the beta of the Notional Business. However, the market interest rate on such loans represents a de facto payment for milk in excess of that specified in the Manual. Any effect this has on beta would affect the milk price paid in accordance with the Milk Price Manual, because beta affects the cost of capital and hence the efficient non-milk costs. However, as argued above, the clear intent of that Manual is to remove Fonterra's control over the milk price, and therefore to remove Fonterra's control over the asset beta. Thus, any beta effect arising from Fonterra's decisions concerning interest-free loans to farmers could not exist for the Notional Business, and therefore such a business could not be making such loans. So, for the purposes of estimating the beta of the Notional Business, such loans must be ignored.

Marsden (2016, section 5) presents beta estimates for a range of listed businesses but adds that he is not aware of any companies that pay their milk suppliers in the fashion that Fonterra does. Since Fonterra's payment formula may significantly change its risk, these comparators are therefore not useful in assessing the beta of Fonterra's actual business, and therefore equally not useful in assessing the beta of Fonterra's Notional Business. The only beta estimates that are potentially useful are for Fonterra itself. The best of these is that using all available data, from Fonterra's listing in November 2012 until December 2015 (three years), and the estimate is 0.30 (Marsden, 2016, page 56). Even this is of limited value because it relates to Fonterra's actual business rather than its Notional Business, and is for a period so short that the estimate would not be particularly reliable. To illustrate the latter point, Marsden (2014, page 35) estimates Fonterra's asset beta up to June 2014 at 0.40. This rises to 0.74 in December 2014, merely by adding a further six months data, and then falls from 0.70 in June 2015 to 0.26 in September 2015 merely by adding a further three months data (Marsden, 2015, page 56). Such extreme oscillations from only a few additional data points undermine the credibility of all of these estimates.

Marsden (2016, section 6) presents brokers' estimates of 0.45 – 0.55 for the asset beta of Fonterra's Ingredients Business. This is a broader operation than Fonterra's Actual Business, which in turn is a riskier business than Fonterra's Notional Business. So, at best, these estimates are upper bounds on that for Fonterra's Notional Business.

Marsden (2016, pp. 6-9) concludes that the asset beta for Fonterra's Notional Business is 0.375, and cites a number of considerations and studies in support of this.[1] However, the only two pieces of evidence that provide estimates close to Marsden's estimate are the Commerce Commission's (2010) estimate of 0.34 for the asset beta for electricity lines businesses (ELBs) and the range of 0.34 – 0.39 obtained by Hird (2016, Table 1) for regulated electricity businesses. Accordingly, Marsden must be giving primary weight to such evidence. Marsden acknowledges that the regulatory regime for Fonterra's Notional Business differs from those to which these comparators are subject, and that it points to a lower beta than that for ELBs, but argues that there is no clear evidence that regulation affects the asset beta (Lally, 2016b; Hird, 2016). However the evidence from the latter two papers relates to price-cap regulation, revenue-cap regulation, and similar schemes, whilst the regime to which the Fonterra Notional Business is subject is entirely different.

As shown in equation (3), the Notional Business is exposed only to the risk of its actual non-milk costs differing from those allowed by the Manual in defining the milk price. Accordingly, the Notional Business is akin to a revenue-capped firm, except that a revenue capped firm faces differences between actual and efficient levels for *all* of its costs whereas the Notional Business faces differences only in respect of non-milk costs. Furthermore, since the milk costs are over 80% of the costs (Marsden, 2014, para 4.3), the Notional Business is much closer to being a cost reimbursement operation, in which revenues exactly match costs (even though the causality runs from revenues to costs in respect of the Notional Business rather than from costs to revenues in a cost reimbursement operation). Marsden (2016, section 3) accepts earlier comments from Lally (2016a) that the "Notional Business" exhibits risk between that of a revenue-capped business and a cost reimbursement operation, and that the cost risk described above could be negative rather than positive beta.

[1] This estimate is for Fonterra's Notional Business as defined by Marsden, in equation (2). This differs from Fonterra's Notional Business as I have defined it in equation (3), due to the price risk from selling RCPs at non-GDT prices rather than GDT prices. However, Marsden (2016, section 3) concludes that the latter risk is not systematic and therefore he would presumably have also applied a beta estimate of 0.375 to Fonterra's Notional Business as defined by me in equation (3).

To assess the beta of the Notional Business, it is useful to consider a business like the Notional Business except that it pays for milk like any other input (from unrelated suppliers) and it is revenue capped. Also, without loss of generality, I assume that depreciation is zero and there is no debt financing. With revenue capping, there is no volume risk and the allowed revenue would comprise the regulator's assessment of efficient milk purchase costs, the efficient level for other opex, and the allowed cost of equity at rate *k* on the regulatory asset base *B*. So, letting *RMIL* denote the regulatory allowance for efficient milk purchase costs, *MIL* it actual counterpart, *ROPEX* the regulatory allowance for other operating costs, and *OPEX* its actual counterpart, the net cash flow of the business would be as follows:

$$NCF = RMIL + ROPEX + kB - MIL - OPEX$$

Accordingly, letting V_0 denote the current value of the business and V_e the value at the end of the regulatory cycle (assumed to be one year merely to simplify the presentation), the rate of return on the business over the regulatory cycle would then be as follows:

$$R = \frac{NCF + V_e}{V_0} = \frac{(RMIL - MIL) + (ROPEX - OPEX) + kB + V_e}{V_0}$$

So, letting R_m denote the rate of return on the market portfolio and σ_m^2 its variance, the asset beta (which would be that of a revenue-capped business operating in the normal manner) would be as follows:

$$\begin{aligned}\beta_{RC} &= \frac{Cov(R, R_m)}{\sigma_m^2} \\ &= \frac{Cov\left(\frac{RMIL - MIL}{V_0}, R_m\right)}{\sigma_m^2} + \frac{Cov\left(\frac{ROPEX - OPEX}{V_0}, R_m\right)}{\sigma_m^2} + \frac{Cov\left(\frac{V_e}{V_0}, R_m\right)}{\sigma_m^2}\end{aligned} \qquad (4)$$

The Fonterra Notional Business differs from this one only in that there is no *MIL* risk. So its beta is as follows:

$$\beta_{NF} = \frac{Cov\left(\frac{ROPEX - OPEX}{V_0}, R_m\right)}{\sigma_m^2} + \frac{Cov\left(\frac{V_e}{V_0}, R_m\right)}{\sigma_m^2} \quad (5)$$

So, it should be possible to use equation (4) to draw some conclusions about the beta for the Fonterra Notional Business in equation (5). In respect of the last term in each equation, if the regulator may err in setting the allowed cost of capital, then V_e will be uncertain. Plausibly, the biggest source of potential error in setting the cost of capital is the risk premium in the cost of equity (the market risk premium and beta). Errors in assessing beta are not likely to be correlated with market returns but errors in estimating the MRP are likely to be so. In particular, if market returns over the period in question are high (low), the MRP is likely to be low (high) at the period end but regulators do not tend to change their MRP estimates (because it is too difficult to estimate these changes). So, if market returns over the period are high (low), the allowed cost of capital is likely to be too high (low), and hence V_e will be too high (low), which is positive beta. In respect of the *OPEX* term in each equation, Marsden (2014, paras 6.18-20) argues that the beta impact will be positive because of macroeconomic cost increases that lower market returns. This is possible and would be akin to an oil price shock. However, as argued in Lally (2016a), an alternative (and more likely) scenario for opex is that in which the cost/GDP direction of causality is reversed: high GDP causes both high R_m and cost increases (because of increased competition for inputs when GDP is high). This is negative beta. The same would apply to the *MIL* term in equation (4), because it would be part of operating costs in a normal revenue-capped business and therefore could be expected to behave in the same fashion, i.e., the price paid by Fonterra if the milk were purchased in the normal commercial fashion from unrelated suppliers would be positively correlated with GDP and therefore the beta impact would be negative. So, the beta in (5) must be greater than that in equation (4), i.e., the beta of the Fonterra Notional Business must be larger than that of a revenue-capped business operating in the normal fashion.[2]

The next question here is the size of the *MIL* term in equation (4), which is essentially the operating cost beta term for a revenue-capped business operating in the normal fashion because the milk costs are most of Fonterra's operating costs. Unfortunately, there is no

[2] In Lally (2016a), I argued that the beta impact of costs was likely to be negative and I implied that the Notional Business would have a beta less than a revenue-capped business operating in the normal fashion. However the analysis here reveals that, if the beta impact of costs is negative, it will cause the beta of the Notional Business to exceed that of a revenue-capped business operating in the normal fashion.

means of reliably estimating this. Accordingly, we are left with the conclusion that the asset beta for Fonterra's Notional Business is at least that for a revenue-capped business. Furthermore, the appropriate asset beta for a revenue-capped business should not exceed that of an otherwise identical price-capped business because the latter faces demand risk, the former does not, and demand risk would raise beta. The Commerce Commission (2010) assigns an asset beta to (price-capped) ELBs of 0.34.[3] The appropriate asset beta for Fonterra's Notional Business should then be 0.34, less a deduction (*VR*) for demand risk to obtain an appropriate beta for a revenue-capped business, plus an increment (*MR*) for the deletion of the milk price risk:

$$\beta_{NF} = 0.34 - VR + MR$$

The Commerce Commission (2010, Para H8.161) considers that empirical evidence on the question of whether the beta for revenue-capped businesses is less than that of price-capped businesses is inconclusive, and therefore applies the same beta to revenue-capped businesses, i.e., *VR* is set to zero. As discussed in Lally (2016b, section 2.2), I concur. Consistency then points to the same treatment for *MR*. So, the estimated asset beta for Fonterra's Notional Business is 0.34.

In summary, Marsden concludes that the asset beta for Fonterra's Notional Business is 0.375, primarily on the basis that this business is similar to regulated ELBs and the latter warrant a beta at this level. However the two regulatory regimes are quite different and Marsden does not address this problem. Nevertheless, the asset beta of Fonterra's Notional Business would differ from that of a revenue-capped firm operating in the normal fashion (by purchasing milk from unrelated suppliers) only in that Fonterra's Notional Business would not face risk from payments for milk, the corresponding revenue-capped firm would, the beta risk to the latter firm arising from the payments for milk would reduce its beta, and therefore the beta of Fonterra's Notional Business would be at least that of a revenue-capped firm operating in the normal fashion. In turn, the appropriate asset beta of a revenue-capped business should not exceed that of a price-capped firm, and the Commission estimates the latter at 0.34 for ELBs.

[3] I do not consider that betas can be estimated to any higher degree of precision than 0.1, and therefore would round 0.34 down to 0.30, consistent with my estimate for these businesses in Lally (2008, section 5.2). However, regulatory consistency across different businesses is important and I therefore defer to the Commission's estimate of 0.34.

So the appropriate asset beta for Fonterra's Notional Business should then be 0.34, less a deduction for demand risk to obtain an appropriate beta for a revenue-capped business, plus an increment for the deletion of the risk from payments for milk. Since the empirical evidence on the question of whether revenue-capped businesses have lower betas than price-capped businesses is inconclusive, the beta for ELBs should also be applied to revenue-capped businesses, and consistency points to the same treatment for the adjustment for milk price risk. Accordingly, the estimated asset beta for Fonterra's Notional Business is 0.34.

3. Asset Stranding

In respect of the possibility of asset stranding (removal of assets from the base used to determine the efficient non-milk costs of the business), Marsden (2016, section 8) estimates the WACC compensation that would be required to Fonterra for this possibility. The result is an estimate for this WACC increment of up to 0.2%, with the extreme case arising from a 5% probability of stranding and 12.5% of the assets being stranded in that event. I concur with Marsden's theoretical analysis.[4] However, Marsden was unable to provide any empirical or other evidence in support of the maximum values for these two underlying parameters, and therefore favoured no WACC adjustment. Conditional on the absence of suitable empirical data, I concur with this conclusion. Furthermore, the conclusion is strengthened by the fact that the WACC adjustment is so small even with a moderate probability of stranding and a moderate proportion of the assets being stranded in that event.

4. Beta and Scale

I have also been asked to address the question of whether the beta of a business is affected by the scale of the business operation. The answer is no and the proof is as follows. Letting R denote the rate of return from a business, NCF the net cash flow from it over a period, V_0 the current value of the business and V_e the value at the end of the period, it follows that

[4] Marsden's analysis is unnecessarily complex, primarily because the conversion to costs per kgMS and its later reversal out is redundant. For example, suppose 10% of the assets were stranded. With 30 year assets lives and an even distribution of ages, deletion of the oldest 10% of plants would remove 2.58% of the book value of the assets as shown in the Table on page 61 of Marsden (2016). With a 7.5% probability of this occurring, the expected loss in book value would then be .0258*.075 = .0019, i.e., 0.19%. So, the allowed WACC should rise by 0.19%, as shown in the Table at para 5.16 of Marsden (2014).

$$R = \frac{NCF + V_e}{V_0}$$

So, letting R_m denote the rate of return on the market portfolio and σ_m^2 its variance, the beta of the business would be as follows:

$$\beta = \frac{Cov(R, R_m)}{\sigma_m^2} = \frac{Cov\left(\frac{NCF + V_e}{V_0}, R_m\right)}{\sigma_m^2}$$

Now suppose that the scale of the business was increased by the factor *K*. This means that its net cash flows and value at each point in time would be increased by that scaling term. Accordingly, the beta of this business would be as follows:

$$\beta_K = \frac{Cov\left(\frac{(NCF)K + V_e K}{V_0 K}, R_m\right)}{\sigma_m^2} = \frac{Cov\left(\frac{NCF + V_e}{V_0}\right)}{\sigma_m^2}$$

So, the scaling term cancels out, leaving the beta of the scaled business identical to that of the original business. This occurs because the only part of beta that involves the business in question is its rate of return (*R*) and the rate of return on an asset is unaffected by scale.

5. Conclusions

My conclusions are as follows. Firstly, in respect of the asset beta for Fonterra's Notional Business, Marsden estimates this at 0.375, primarily on the basis that this business is similar to regulated Electricity Lines Businesses (ELBs) and the latter warrant an asset beta at this level. However the regulatory regimes for these two types of businesses are quite different and Marsden does not address this problem. Nevertheless, the asset beta of Fonterra's Notional Business would differ from that of a revenue-capped firm operating in the normal fashion (by purchasing milk in arms-length transactions from unrelated suppliers) only in that Fonterra's Notional Business would not face risk from payments for milk, the corresponding revenue-capped firm would face this risk, the beta risk to the latter firm arising from the

payments for milk would reduce its beta, and therefore the beta of Fonterra's Notional Business would be at least that of a revenue-capped firm operating in the normal fashion. In turn, the appropriate asset beta of a revenue-capped business should not exceed that of a price-capped firm, and the Commission estimates the latter at 0.34 for ELBs. So the appropriate asset beta for Fonterra's Notional Business should then be 0.34, less a deduction for demand risk to obtain an appropriate beta for a revenue-capped business operating in the normal fashion, plus an increment for the deletion of the risk from payments for milk. Since the empirical evidence on the question of whether revenue-capped businesses have lower betas than price-capped businesses is inconclusive, the beta for ELBs should also be applied to revenue-capped businesses, and consistency points to the same treatment for the adjustment for milk price risk. Accordingly, the estimated asset beta for Fonterra's Notional Business is 0.34.

Secondly, in respect of the possibility of asset stranding (removal of assets from the base used to determine the efficient non-milk costs of the business), Marsden estimates the WACC compensation that would be required to Fonterra for this possibility at up to 0.2%, with the extreme case arising from a 5% probability of stranding and 12.5% of the assets being stranded in that event. I concur with Marsden's theoretical analysis. However, Marsden was unable to provide any empirical or other evidence in support of the maximum values for these two underlying parameters, and therefore favoured no WACC adjustment. Conditional on the absence of suitable empirical data, I concur with this conclusion. Furthermore, the conclusion is strengthened by the fact that the WACC adjustment is so small even with a moderate probability of stranding and a moderate proportion of the assets being stranded in that event.

Thirdly, in respect of whether the beta of a business is affected by the scale of its operations, the answer is no. This occurs because the only part of beta that involves the business in question is its rate of return and the rate of return on an asset is unaffected by the scale of its operations.

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