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REPORT TO FONTERRA: ASSET BETA AND CEPA'S RESPONSE TO PARTINGTON AND SATCHELL

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Author's Credentials

This report has been prepared by Associate Professor Graham Partington and Professor Stephen Satchell. We are senior finance academics who have published several books and many research papers in finance. We have extensive consulting experience, particularly with respect to the cost of capital and valuation. Our *curricula vitae* are available on request.

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The context of the report

We have been asked by Fonterra to provide a brief response to the report by Cambridge Economic Policy Associates (2019), hereafter CEPA. CEPA were retained by the by the Commerce Commission to comment on our paper, Partington and Satchell (2019), hereafter P&S, which was commissioned by Fonterra. These reports were concerned with the asset beta that was appropriate for use in determining the allowed rate of return to be used in setting the milk price paid by Fonterra

1. Important issues that CEPA neglects

On page 1 of their report CEPA state that they have focussed on the most important issues raised in the P&S report. We begin by considering important aspects of our report to which CEPA makes little or no response. We consider that Point 1 in the executive summary of P&S is one of the most important aspects of our report, yet it is largely neglected by CEPA.

Determinants of the asset beta

CEPA makes the point that the asset beta is determined by industry characteristics. Given that CEPA makes this point, we are somewhat puzzled that CEPA's does not really address Point 1 in the executive summary of P&S. Point 1 summarises the analysis of the effects of the revenue beta and operating leverage (fundamental industry characteristics) and the resulting conclusion that the asset beta for the notional processor must be low. Perhaps this analysis is ignored because CEPA considers that we focus only on short term revenue and ignore the long term value that investors attribute to companies. CEPA, p.2 states:

> *"In addition to the impact of short term revenue changes, the focus of P&S, asset beta is influenced by the long-term value that investors attribute to companies."*

As we explain below, a conclusion that we focus only on the short-term revenues and ignore the long-term value of companies is incorrect. Both our valuation analysis and our analysis of the interaction of the revenue beta and operating leverage relate to the short and long term.

Our starting point for considering valuation of the notional processor was the following valuation equation:

$$PV_{asset} = PV_{revenue} - PV_{milk\ cost} - PV_{non\text{-}milk\ variable\ costs} - PV_{fixed\ cost} \qquad (1)$$

Where *PV* represents present value, which is the discounted value of all the expected cash flows. The present value of an asset reflects all the future cash flows, not just the short-term cash flows. Indeed, the foregoing equation can be rewritten as:

$$PV_{asset} = PV_{short\ term\ cash\ flows\ to\ time\ t} + PV_{residual\ value}$$

Where *PV* residual value is the present value of the longer term cash flows beyond time *t.* In other words, the residual value represents the long term valuation that investors attribute to companies. Equation 1, therefore, encompasses the residual value. It is on the basis of equation 1, that we analysed the risks faced by the notional processor and concluded (P&S, Executive summary, Point 4) that:[1]

> *"Variation in non-milk variable costs relative to the efficient cost together with errors in the allowed rate of return are key risks for the notional processor. Risks due to asset stranding and growth options are likely to be relatively unimportant. Considering each of the foregoing risks, they are likely to have a very substantial idiosyncratic component and hence the systematic component (i.e. their contribution to the asset beta) is likely to be small."*

This conclusion was reached by consideration of both short and long term cash flows contrary to CEPA's claim. We did not separately consider long-term and short-term systematic risk and so we did not assert as CEPA, p2. claim"…*that systematic risk associated with the long term is small*…". However, we agree with CEPA's statement (p.2) that:

[1] The Commerce Commission's consultant, Lally (2016) reached similar conclusions, particularly with respect to variation in non-milk costs and errors in the allowed rate being the key risks. With respect to reaching their conclusions on these key risks, Lally and P&S use different methods of analysis. The fact that alternative analyses lead to the same conclusions suggests a robust result. The fact that the Commission's consultant and Fonterra's consultants reach the same conclusion also suggests a robust result.

"Industries with prospects that are more highly correlated to the economy have higher asset betas even though the approach to and structure of price controls is similar."

The correlation of industry prospects with the economy is reflected in the revenue beta of firms in the industry, but it is also affected by operating leverage. We now turn to a discussion of these variables and their effects across an industry.

Clearly the asset beta of a firm is determined by the firm's characteristics, but the relevant characteristics tend to be similar across the firms in an industry. So CEPA's point that the asset beta is determined by the characteristics of the industry is usually a good approximation. As corporate finance textbooks explain, the two main characteristics determining the asset beta are the cyclicality of revenue, which is captured in the revenue beta, and the level of operating leverage.

Cyclicality of revenue and operating leverage tend to be similar across an industry as they are typically fundamental to the nature of the industry. For example, for firms in industries that require a large investment in fixed assets, fixed costs tend to be higher and consequently there is higher operating leverage. Cyclicality of revenue and fixed cost structures therefore represent long term characteristics of industries.

It is very well established that the asset beta is fundamentally determined by the revenue beta scaled up by the effect of operating leverage.[2] The resulting asset beta captures the risk inherent in the investment in the asset. This applies both to the residual value and to shorter term fluctuations in cash flow. The asset beta, which depends on the revenue beta and operating leverage, measures the risk of both current and future cash flows.

The Commerce Commission makes the argument that there is little relation between the revenue of the notional processor and the New Zealand market, we agree. Indeed, CEPA's (March 2018) analysis of the correlation between the NZ dairy commodity prices

[2] See for example various editions of the classic corporate finance texts: Brealey and Myers "Principles of Corporate finance", or Ross, Westerfield and Jaffe "Corporate Finance". There is even a YouTube video on this see https://www.youtube.com/watch?v=aicGlGeQhYU, which is associated with the European edition of "Corporate Finance".

and returns on the NZ stock exchange showed correlations that were approximately zero, or substantially negative. The consequence is that the revenue beta is going to be rather small. Due to the method of determining the milk price, the effect of operating leverage is also going to be rather small. As a result of a rather small asset beta and a rather small effect from operating leverage, the asset beta will also be rather small.

The effect of revenue cyclicality and operating leverage was a critical aspect of our report and since CEPA's response did not really address this analysis, perhaps a little more explanation is in order. The cyclicality of revenue reflecting sensitivity to economic cycles is straightforward enough, but in the current case the effect of operating leverage is more complex than usual.

The normal effect of operating leverage is to magnify positive net cash flow and profits when revenue is above the breakeven level and magnify negative cash flow and losses when revenue is below the breakeven level.[3] In the case of the notional processer, however, adjustments to the milk price offset the variations in revenue. As revenue goes up the milk price rises and vice versa, consequently the notional processor's breakeven point shifts in such a way as to nullify the effect of operating leverage on cash flow and profits. Indeed, the objective of regulation is to have the notional processor operating at the present value breakeven point. The residual income[4] at this breakeven point would be zero, which is equivalent to investors earning exactly their required return and investments having a zero NPV.

In a perfectly regulated world, operating leverage would have no effect for an efficient milk processor and residual income would always be zero. However, regulation allows efficiency incentives, and this means that there can be positive or negative residual income depending on how efficient processors are with respect to non-milk variable costs. Super-efficient processors are allowed to earn a positive residual income, while inefficient processors will earn a negative residual income. In the case of the notional

[3] Many management accounting textbooks and corporate finance textbooks explain these effects. The breakeven analysis can be carried out on the basis of present values, or accounting profit. The breakeven point for accounting profits is lower than the breakeven point for present values, since the former does not allow for the time value of money and hence omits the required return on capital.

[4] Residual income is profit less a charge for the required return on capital.

processor, however, non-milk variable costs are a small proportion of total variable costs and so the effect will not be great. In the light of the foregoing discussion we would expect, to a first approximation, that the asset beta of the notional processor would only be only slightly greater than the revenue beta.

A consequence of differences in cash flow risks

We do not accept CEPA's assertion that we focus on short term fluctuations in cash flows and ignore the risks to residual value. Our view is that the systematic risk of the notional processor is small and we make no distinction between the short and long term. However, we point out that there are some logical consequences to assuming differences in risk to short-term cash flows and the longer term cash flows that determine the residual value. If CEPA and the Commerce Commission want to sustain the argument that there is a difference in risk between short term cash flows prior to the date *t* at which the residual value is computed and longer term cash flows beyond the date *t*,[5] then the corollary is that different discount rates (required rates of return) will apply to these cash flows. Thus, two discount rates are required, one for the short term cash flows and a different rate for the longer term cash flows. CEPA's arguments seem to imply the short term fluctuations in cash flows are less risky than the residual value (long term value). If so, the short-term cash flows should have the lower discount rate. Given milk prices set year by year, we are clearly dealing with short term cash flows, such as revenue one year ahead, and so the lower discount rate should apply. We are not advocating this line of argument, but rather pointing out that it is a logical consequence of assuming differences in risk between short-term and long-term cash flows.

[5] Total risk is greater the further into the future that we look because the risk accrues over more periods. The issue here, however, is the period by period risk. If risk varies period by period, say in particular years, then a different discount rate applies in the years when the risk is different.

2. De-levering equity betas

CEPA also fail to respond to our comments about de-levering. We point out that we have reservations about the process of de-levering the equity beta to get an asset beta and we observe, P&S p.11, that:

> *"Several alternative de-levering formulas are available and quite different asset betas can be obtained depending on the formula employed. Except in the case of Marsden, who states that Hamada's formula is used, we could not find a clear statement about which de-levering formula was used or whether the effect of taxes was considered. In de-levering, there are also issues in relation to the measurement of leverage and assumptions about the magnitude of the debt beta that can be problematic. For example, differences in unlevered betas will arise depending on whether total or net debt is used in the leverage calculation."*

CEPA's response neither addresses the substantive issue of problems in de-levering the equity beta, nor explains the method of de-levering used for the comparator set. We consider that knowing exactly what was done is very important to the transparency, reproducibility and validity of the comparator results.

3. CEPA's main responses

We now consider CEPA's main responses to P&S. CEPA's main responses are summarised in five dot points contained on pages 1 and 2 of their report. We proceed below by presenting their dot points followed by our comments.

CEPA Point 1

- P&S reject the use of all the data from comparators arguing that they have different characteristics to a Notional Processor (P&S ES points 1 and 2). However, the detailed analysis set out in CEPA (2018) indicates that the systematic risk of the comparator group is similar to that of a Notional Processor and therefore provides relevant evidence. Many companies, like the Notional Processor assumed by Fonterra, can pass through commodity price risk to suppliers, albeit with a lag, which would not materially affect long term value and beta. In addition to the impact of short term revenue changes, the focus of P&S, asset beta is influenced by the long-term value that investors attribute to companies. Our analysis in CEPA (2018) indicates that the factors that affect long-term value are best reflected in the comparator group.

Response

P&S point 1 is not about data. As we have explained earlier CEPA do not address our point 1. The lesson that CEPA could have drawn from P&S point 1 is that in the selection of a comparator consideration should be given to the likely magnitude of the comparator's revenue beta and the effect of their operating leverage.

In P&S point 2, we say:

> *"Does the Commerce Commission's comparator set of firms provide an appropriate estimate of the asset beta for the notional processor? The answer to this question is no."*

We do point out that many of the comparators are a poor match for the characteristics of the notional processor, but this is not a rejection of all the data from the comparators as claimed by CEPA. Rather our conclusion is that the current methodology is deeply flawed, for reasons that we explained in our report. Consequently, the estimate of the asset beta is not appropriate. There is a very large difference between rejection of data and rejection of a methodology employing data. Indeed, rather than rejecting the data we suggest the use of fuzzy sets as a method to better employ the data.

We stand by our statement in P&S that the one of the problems with the comparator set is that the sample is heterogeneous and that sample members have different characteristics than the notional processor. An analysis that fails to account for this is of little value.

CEPA Point 2

- P&S reject the use of all data from companies outside New Zealand (P&S ES point 2). They argue that betas from companies in different countries are measuring different things. However, if betas are compared across markets where the equity market risk premium is similar (like developed markets) beta can represent systematic risks that can be compared and with careful judgement can be used for the determination of cost of capital parameters. It is open to the Commission to make adjustments for the differences between markets.

Response

Our statement in P&S point 2 that it is wrong to average betas calculated against different market indices is one we stand by. We also have a strong preference for comparators drawn from New Zealand. One reason for this is that we consider that betas from companies in different markets are measuring different things. Consequently, great caution must be employed when utilising evidence from betas taken across different markets. That is not to say that careful judgement and adjustments cannot be employed to reduce the implicit errors in the process. Indeed, in P&S we outline the use of fuzzy sets and regression of returns against a common index as a way to reduce the errors involved in CEPA's analysis. We repeat, as in our answer to 1 that we are not rejecting data as claimed by CEPA, but rather the misuse of it.

At a later stage CEPA (page 9, para 1) make the astonishing logical leap that:

"P&S assertion that the data from different markets are not comparable, which implies that they provide no useful information"

This is simply not true; we do not assert that they provide NO useful information. We do assert that there are serious difficulties in taking regression coefficients from regressions involving different variables, estimated across dissimilar firms, and then using simplistic averaging techniques as employed by CEPA.

To illustrate some of the problems in simple averaging, consider the following analysis. Suppose we have a set of French dairy businesses whose returns satisfy a French CAPM;

$$R_{it} = \beta_i R_{ft} + e_{it} \quad (2)$$

Where R_{it} is the excess return on asset i at time t, excess relative to the French euro 10 year bond rate, and R_{ft} is the excess return on the French equity market at time t, excess relative to the French euro 10 year bond rate .We have N such dairy companies and CEPA philosophy says we should take the average in computing the beta for the notional processor.

The above differs from the NZ CAPM in two critical ways, firstly the bond rate is different and secondly the market return is different. For simplicity, we shall assume that the two countries interest rates are identical and focus only on differences in market rates of return. We shall assume that e_{it} is indepenent of R_{nzt}, the excess rate of return on the NZ market. Then measuring all excess returns relative to the NZ 10 year bond rate we get:

$$R_{ft} = \beta_{nz} R_{nzt} + v_{it} \quad (3).$$

Substituting (2) into (3) gives,

$$R_{it} = \beta_i(\beta_{nz} R_{nzt} + v_{it}) + e_{it}$$

We see that the correct beta in this case is $\beta_i \beta_{nz}$ and the average, if this is what we want to use needs to be scaled by β_{nz} the beta of the French equity market on the NZ equity market.

CEPA Point 3

- P&S assert that Fonterra's beta provides good evidence of the beta for an efficient processor (P&S ES point 3). However, while its corporate structure meets the needs of its shareholders, its distinct structure influences the way it trades making its beta a poor proxy for that of an efficient processor. First, the shareholders of Fonterra are also suppliers to it, and it has a stated objective to maximise the value of a package of rights that its farmer suppliers enjoy rather than the value of the shares. Changes in the value of the processing business therefore don't necessarily feed through to the listed share value, but rather may be reflected in a change in the value of the supply contracts, which are unobserved. Second, the bulk of shares traded in Fonterra and linked rights to the Fonterra Shareholder Fund are bought or sold by farmers. These transactions are likely undertaken to meet obligations to own shares related to milk supply volumes, rather than being the portfolio decisions of diversified investors. Therefore, its share price movements are unlikely to have the same relationship to general stock market movements that other shares do. Third, investors do not see the Fonterra Shareholder Fund as an investment substitute for electricity lines businesses (ELBs).

Response.

CEPA's analysis has been carefully done and their arguments are worthy of consideration. It seems clear that the shareholder register is dominated by the clientele of farmer shareholders, but as we explain later particular shareholder clienteles are not an unusual feature of capital markets. Neither does it automatically follow that the majority shareholders determine prices at the margin.

A major plank of CEPA's critique is that Fonterra is a cooperative. If the notional efficient processor is a cooperative, then CEPA's argument is substantially weakened. In figure 2.1 of CEPA (March 2018) which describes the characteristics of the notional processor, it is stated that:

> *"Like Fonterra, the notional processor is assumed to be a cooperative"*

Thus, it is the beta for a cooperative that is required and on the basis of CEPA's figure 2.1 it is a cooperative very like Fonterra.

If regulation is successful in setting a competitive milk price, then this would eliminate the major source of potential extra return (upward bias in the value of supply contracts) that shareholder farmers could enjoy. Consequently, with effective regulation, changes in the value of Fonterra would be similar to those of a normal company. The question is how effective is the regulation?

We also observe that it is common for shareholders in a company to obtain different cash flows at a personal level. This is due to differences in taxation and also transaction costs, this can lead to dividend and transaction cost clienteles on company share registers. Other clienteles also exist, for example financial institutions tend to be overweight in dividend paying stocks, and CEPA notes the existence of infrastructure clienteles. The point is that such effects are pervasive and do not exclude firms from being subject to the normal capital market equilibrium pricing. Departures from equilibrium are likely to give rise to arbitrage opportunities and arbitrageurs trading at

the margin are likely to drive the price back to equilibrium. We are not convinced that CEPA's analysis rules out such arbitrage.

On balance, while we consider that CEPA's arguments have some merit, we are not convinced that they rule out the use of Fonterra's beta. Our views on the absolute necessity of including Fonterra as a comparator are strongly influenced by a shortage of New Zealand comparators and that Fonterra is likely to be the closest thing to the notional processor. Indeed, the description of the notional processor given by CEPA (March,2018) in Figure 2.1 is largely based on the characteristics of Fonterra.

We were particularly struck by Lally's (2016, p6) observation that

"The only beta estimates that are potentially useful are for Fonterra itself"

We have read a number of papers by Lally and he is not given to ill-considered statements, he is very familiar with the New Zealand financial environment and he has consulted extensively to the Commerce Commission. Therefore, we consider that his observation carries substantial weight.

CEPA (p.10) also claim that Fonterra shares have low liquidity. However, we understand that Fonterra's shares/Fonterra share fund trade nearly every day and CEPA reports average daily volumes in the order of hundreds of thousands of shares. This does not sound to us like a stock where thin trading is a major problem in estimating beta. We also observe that Fonterra Shareholders Fund is listed on the ASX. At the time of writing, the bid–ask spread was two cents on a share trading at about $3.60. This is significant because the bid-ask spread is commonly used as a measure of liquidity and a spread of two cents on a $3.60 share does not suggest a stock with low liquidity.

CEPA Point 4

- P&S assert that the systematic risk associated with the value of assets in the long-term is close to zero for a notional processor (P&S ES point 4). However, evidence from asset betas in regulated industries are sufficiently high that changes in the value of businesses in the long-term must be a key determinant of the asset beta. We consider that the size of "long-term" beta is also too

large to be caused by regulatory errors in the cost of capital. The asset betas for different regulated industries with varying growth opportunities but the same type of price control is different. Industries with prospects that are more highly correlated to the economy have higher asset betas even though the approach to and structure of price controls is similar. The assertion by P&S that systematic risk associated with the long-term is small is not consistent with the evidence

Response.

As we have explained earlier the view that we ignore risk in the long term is not true of our analysis. We have also pointed out that we agree that industries with returns more highly correlated with the economy have higher betas. We have further explained why we expect that for the notional processor that revenue will be little correlated with economy, operating leverage will not have much effect, and at our point 4 we explain other risk factors will only have a small systematic component. Hence, we expect that the notional processor will only have a small systematic risk.

We accept that other regulated firms may have higher systematic risk because their returns are more highly correlated with the economy. However, we note the unusual nature of Fonterra, and hence the notional processor, compared to other regulated firms. Most regulated companies have output that is consumed domestically and assuming the domestic market broadly reflects domestic demand, it will be appropriate to measure risk using a domestic beta.

However, for a company whose revenue is largely driven by exporting as is the case for Fonterra, we would not expect the same degree of exposure to the domestic market but a higher exposure to some version of a global market (or at least the subset of countries who import dairy products from New Zealand.) There needs to be clarity about what the: “true model” is assumed to be. Is it a version of the CAPM based on the NZ market or a version of the CAPM based on some subset of the world economy? The regulators have chosen a domestic CAPM. Thus, for the purposes of computing beta, we need only consider covariation between domestic market returns and the asset returns. Thus, if there is a shock to global risk, we can decompose that shock into a component exposed to the domestic market and adjust the beta up or down depending upon its nature, but the rest of the shock that is uncorrelated with the domestic market will be

a contribution to idiosyncratic risk. The fact that Fonterra and the notional processor export almost all their product and are therefore mainly subject to shocks on the world market means that the beta with respect to the domestic market is expected to be low.

CEPA Point 5

- P&S assert that the form of regulation of a Notional Processor is similar to that of ELBs, and therefore the beta for a Notional Processor will be the same as that of ELBs (P&S ES point 5). However, the Commission has itself reported that there is no empirical evidence that differences in regulation have a measurable impact on asset beta. Moreover, the analysis of different members of the comparator set in CEPA (2018) shows that exposure to different levels of commodity risk doesn't have a material impact on the beta estimate. As noted above, in our view, this is because it is industry characteristics that affect the long-term value of the business. The way that value changes in response to changes in the economy for a Notional Processor is much more likely to reflect the way that value changes for the comparator group rather than ELBs.

Response

We do not assert that the form of regulation of a Notional Processor is similar to that of ELBs, and therefore the beta for a Notional Processor will be the same as that of ELBs. What we actually say in P&S point 5 is:

> *"Does the notional processor have a similar asset beta to the ELBs? The issue here is whether it is regulation or the nature of the business that is the main determinant of the asset beta. We find considerable merit in Lally's (2016) argument in favour an asset beta for the notional processor equal to an ELB."*

This means what it says, there is a question to be addressed and we find considerable merit in Lally's answer to the question. This is not an assertion and it recognises that there is a question to be addressed. In answer to this question, the Commerce Commission may have reported that "that there is no empirical evidence that differences in regulation have a measurable impact on asset beta",[6] but we had no difficulty in finding empirical evidence showing that regulation affects beta, Binder and

[6] In the body of CEPA's paper, there is a somewhat different statement from that made in the dot point. That statement is (p.11) "that there is insufficient empirical evidence for it to be relied upon for regulatory decisions". The evidence that we identify seems quite strong, but we have not conducted a comprehensive literature review and there may be countervailing empirical evidence that we have not seen.

Norton (1999), that changes in regulation affect beta, Grout and Zalewska (2006), and that differences in regulation affect beta, Alexander and Irwin (1996).

The essence of the issue here is which is a better comparator set, ELB's or international firms in the dairy industry. We have argued that as currently used the international firms in the dairy industry are poor comparators. CEPA argue, rather unconvincingly, that we should be looking at global industry changes as the source of variation in the long-term value of the business. We note that their comment is very reminiscent of debates in global portfolio management where managers choose to segregate stocks by country versus by industry. What is found is that there are periods where industry segregation matters more than country segregation; there are times when the opposite holds. Given our comments at the end of point 4 above, much of the global industry shock may well be idiosyncratic to the NZ market and therefore not contributing to systematic risk as defined by a NZ CAPM.

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