FUNDING THE FLOW OF MILK:

Dairy Industry Capital requirements

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1.0 THE DAIRY INDUSTRY:

The dairy industry in New Zealand began after the importation of two cows and a bull in 1814 with the first dairy exports leaving our shores in the 1840's. Since then the dairy industry has grown to a point were in 2010 it directly contributed $5b worth of value (GDP) to the New Zealand economy, the equivalent of 2.8% of GDP. An NZIER report put this in perspective in 2010, sighting this makes the dairy industry:

- A greater contributor to GDP than fishing, forestry and mining combined
- Over 1/3 of total primary sector GDP contribution
- 26% of NZ's total exports.

Globally, New Zealand is the largest exporter of dairy exported products, representing approximately one third. The industry has worldwide recognition for a grass based production system, technology, wealth creation and profitability amongst others.

Over the past 10 years the growth of the industry has speed up to a point where 1.685b kgMS were produced in the 2011/12 season – a 41% rise from 10 years earlier.

Due to New Zealand's competitive advantages the industry is well placed to continue to grow. The Situation and Outlook for Primary Industries in 2013 forecast the milk production will continue to grow Y.O.Y by 4% per annum until 2017.

2.0 THE PURPOSE OF THIS REPORT:

The purpose of this report is to understand the capital invested in the industry and what this could mean for funding future growth?

This question has been of personal interest for two reasons:

Firstly, there appears to be an increasing amount of media coverage to the total value of debt within the dairy industry. Headings such as "Debt weighing down dairy sector", "Dairy farmers deep in debt", "Concern over level of dairy farm debt" have been seen in the media. The majority of these articles site the growing total debt in the dairy industry saying this leaves the industry more vulnerable. I feel a better analysis is required to make these judgments.

Secondly, the future growth of the dairy industry will require capital. The question is: What is the more desirable way for this growth to be funded? And, Can we learn anything from the past?

Funding this growth correctly will be crucial to not only building a sustainable industry but also New Zealand's economic prosperity due to its contribution to the economy.

3.0 RESEARCH QUESTIONS:

1. What is the total value of the capital invested in the dairy industry, how has this changed over the past 10 years and why?
2. What is the breakdown of this investment between debt and equity?
3. What is the relationship between the capital invested and the industry profitability?
4. What other factors, aside from profitability could contribute to the way in which capital is invested in the industry?
5. What conclusions can be drawn about what this means for funding future growth?

4.0 CONTEXT - WHAT IS CAPITAL?

4.1 What is capital?

Capital can be defined as "the funds a business uses to purchase real assets for producing goods and services that generate returns".

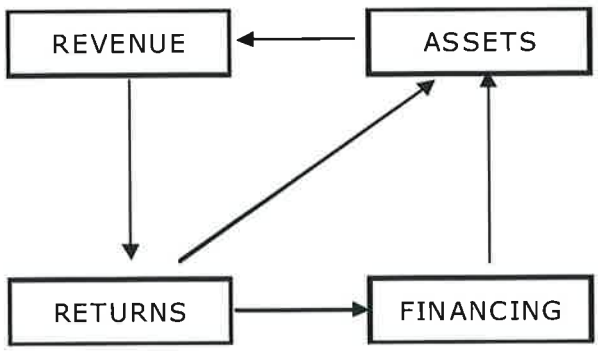

Figure 1: Simple business cycle (ANZ)

The simple diagram above demonstrates this relationship that continues as a cycle. The first step is that capital is used to fund means of production and labour power. These in-turn are used to create goods

and or services with a greater value than the means of production. These returns can be profits or cash and are used for reinvestment into assets and to repay financiers.

4.2 Types of capital?

Fundamentally there are two types of capital: owned and borrowed.

Owned capital is that contributed by the owner of a business, and obtained by means of saving or inheritance, and is known as owners capital or equity. Whereas capital that is granted by another person or institution is called borrowed capital or debt. This obligation usually incurs interest.

4.3 Why should it be of interest?

A recent report detailing the size of the prize by becoming Asia's food bowl attempted to quantify the amount of capital required by 2050 as $210b across New Zealand agricultural industries and supply chains to meet growing market opportunities. It then cited that Farmers equity provides limited additional capital due to low profitability suggesting farmers have the opportunity to spend around 12% of revenues on growth related capital. Furthermore with New Zealand's annual savings gap averages about 4-5% of GDP due to poor saving and high domestic investments meaning domestic sources are unlikely to provide the answer to how the future of the industry may be funded. Therefore foreign capital needs to be accessed to help fund this potential.

New Zealand's low on farm profitability has meant that the majority of growth in the industries capital has come from debt funding. Therefore in relation to the diagram above people borrow to purchase assets that return more than the interest on the debt, or in finance terms debt is a means of using anticipated income and future purchasing power in the present before it has actually been earned.

This use of debt magnifies potential profits but conversely can magnify potential losses. The ratio of debt financing to equity is referred to as leverage. It has to be optimized as high leverage can bring high profit but creates solvency and liquidity risk when the expected future cash flow isn't enough to meet financial obligations.

Therefore we need to understand what capital is used for, what types of capital there are, and the risks of debt capital, is there anything that can be learnt from the past growth of the dairy industry that is important for future growth?

5.0 DAIRY INDUSTRY CAPITAL

Research Question: What is the total capital invested in the dairy industry?

It is assumed that the capital invested in the dairy industry is made up in three parts:

1. Livestock
2. Land buildings and dairy company shares
3. Plant, machinery and vehicles.

All off farm investments, which may have resulted in increased dairy debt, have been excluded from this report.

5.1 Value of Livestock

To calculate the amount of capital invested in livestock we must first define the number of cows in the industry and then determine a value for these livestock. The number of cows milked is accurately recorded in the New Zealand Dairy Statistics 2011-12. What isn't recorded is the number of replacement stock owned on dairy farms. Research found suggested that the average replacement rate on farms is 21.3% across the whole industry. Therefore the number cows milked was multiplied by this replacement rate to define the number of young stock in the industry.

To calculate the values, it was decided that National Average Market Values published by IRD were the most accurate record of the value of stock. IRD uses these values for tax purposes but has a robust process of defining the value for a specific period using market evidence.

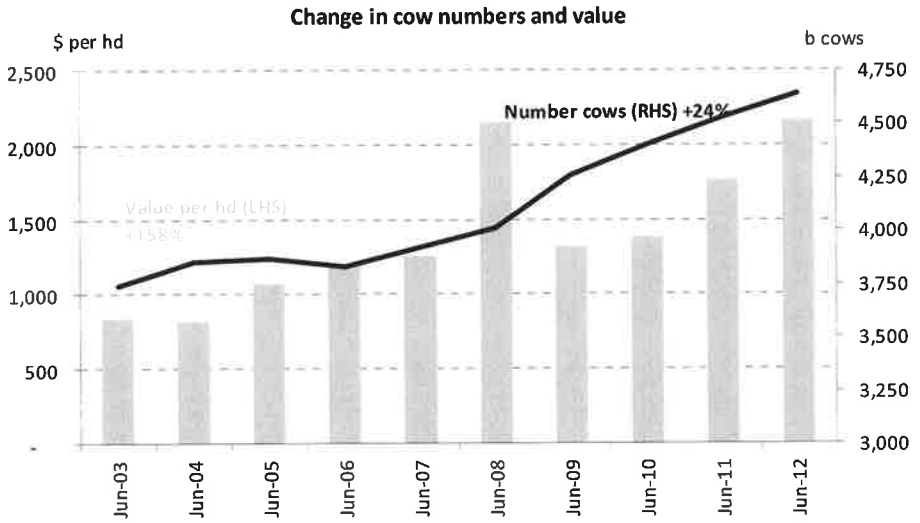

Figure 2: Change in milking cow numbers and value per head over the past 10 years (sources Dairy NZ, IRD)

The graph above shows that over the past 10 years the number of cows milked has increased by 24% to 4.634m cows and the value per head has fluctuated widely. Across the 10 years this has increased from $835 to $2,155 per head a 158% increase in value. These two have combined mean the total value of livestock in the dairy industry has increased 229% from to $3.4b to $11.2b.

The increase in value of the livestock has a strong relationship to dairy payout across the seasons. This makes sense suggesting that what people are prepared to pay for a cow is strongly correlated to the revenue they can earn. This correlation is demonstrated in the below graph.

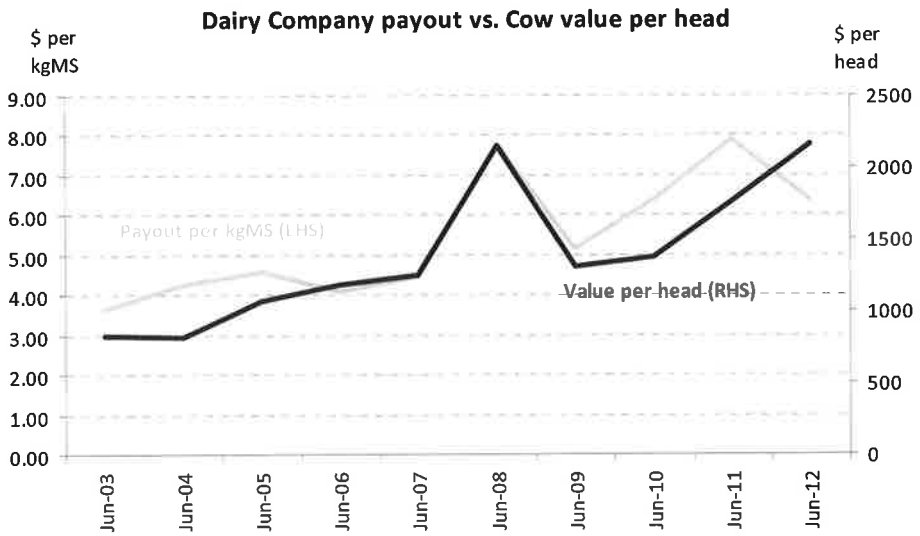

Figure 3: The relationship to cow value per kgMS and payout over the past 10 years (sources DairyNZ).

5.2 Value of Plant, Machinery and Vehicles

There is little evidence of the value of plant and machinery in the dairy industry. The best source of data was from the Dairy NZ Economic Survey. This survey gives a per herd value for plant across an estimated 200 farms annually measured. How they derive this value in their analysis is not clearly stated. This number was divided by the kgMS produced to calculate the value of plant and machinery they own per kgMS. This multiplied by the total industry production defines the total capital the industry has invested in plant, machinery and vehicles. This is a rough measure of the value but given that plant makes up 3% of the total farm capital in 2012 as seen further through the report then the error this creates is minor in the scheme of the trends.

The table below shows the total value of capital invested in plant, machinery and vehicles.

PLANT VEHICLE AND MACHINEY VALUE		
	$ per kgMS	Value ($b)
Jun-03	1.22	1,453
Jun-04	1.14	1,430
Jun-05	1.21	1,468
Jun-06	1.32	1,672
Jun-07	1.38	1,816
Jun-08	1.40	1,778
Jun-09	1.41	1,964
Jun-10	1.65	2,373
Jun-11	1.40	2,118
Jun-12	1.44	2,426

Figure 4: Capital invested in Plant, Machinery and Vehicles (sources DairyNZ)

The total value invested in plant, vehicles and machinery has increased 67% from $1.45b to $2.43b. This increase in total value has grown at a rate faster than increased production which has grown by 41% over this time. This could be caused by one of, or both of the following reasons.

1. The increase in production has been more machinery intensive per unit produced.
2. The value of machinery has increased per unit required.

5.3 Value of Land, Buildings and Dairy Company Shares

The amount of capital invested into land was determined by establishing fair market value for the total dairy industry. The definition of fair market value for land is often expressed as, "the highest price in dollars, that a property would bring in an open and unrestricted market between a willing buyer and a willing seller who are both knowledgeable, informed, and prudent and who are acting independently of each other".

The total capital invested into land, building and shares makes up over 80% of the total capital invested in the dairy industry. Therefore the focus had to be on getting this method as accurate as possible as it would present the largest statistical error.

As there is no direct analysis valuing the total land associated with the dairy industry three different methods were considered to help establish the fair market value. These were, to extrapolate the median sale price of dairy land per ha, the median sale price per kgMS of dairy land or the Quotable Value (QV) for all dairy farms in the country.

The three pros and cons of each were analyzed below.

PROS' AND CONS' of METHODOLOGY		
	PROS	CONS
Median sale per ha	Price per ha well measured	eff milking area unreliable
	Fair market value	No measure of productivity
Median sale per kgMS	Production well measured	No consideration for land area
	Market considers productivity	
	Fair market value	
QV	Value based on sales evidence	Difficulty of accessing data
		Time to summate all data

Figure 5: Pros and Cons of each methodology to establish fair market value.

QVNZ accurately records the sales evidence of dairy farms that occur in New Zealand. It was decided that this information was the best proxy of fair market value, against the definition above as most of the required elements are present. This information was then extrapolated across the whole industry. The biggest challenge was to decide which metric to extrapolate against; either sale price per ha or sale price per kgMS. The difference between the two methods plus or minus 30% across the years measured.

The graph below demonstrates the difference between the two different methods which were plus or minus 30%, by the tenth year of analysis the difference was 10% which is still a large error of $6b. It was decided that the metrics that would be used for the rest of the research was the average sales price across the year per kgMS multiplied by the total production in that year to derive a value for the land and buildings as at June in that year. It was believed that the production data was more accurate than the total eff area milked.

It needs to also be noted that it assumes that the value of dairy company shares is included in the value of the land from the REINZ sale information. Until the end of 2012 when TAF was launched, the value of the shares was incorporated in the land value.

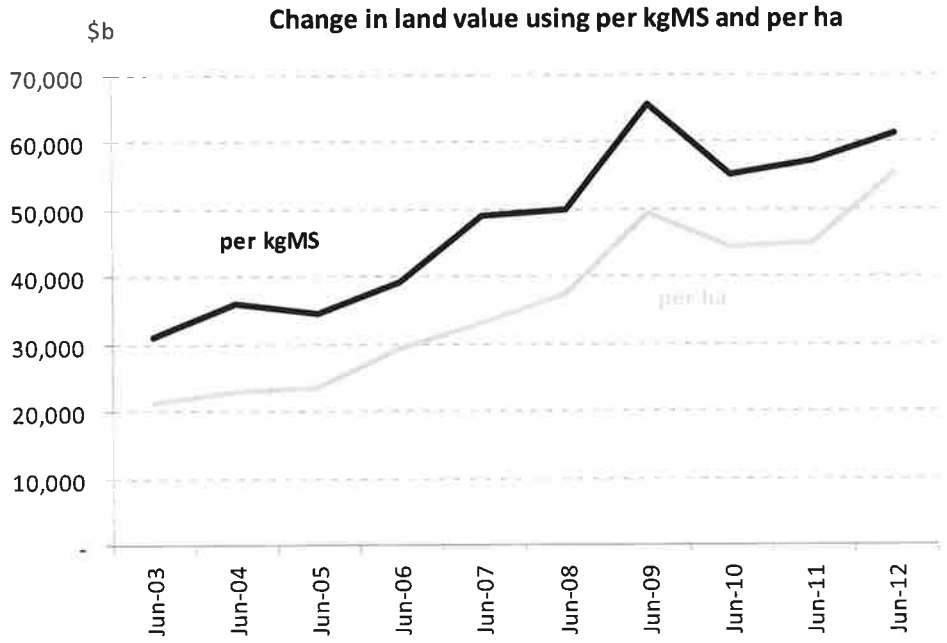

Figure 6: Extrapolation of per kgMS and per ha sale price to calculate total capital value for the industry (QVNZ)

The significant shortcoming of valuing land by this means is there is no allowance for owned dairy runoff land. It is known that a large number of farmers own runoff's but finding data to support the area of these runoff's was a challenge, meaning attributing a value to these was impossible. It is therefore known that the total capital invested into the dairy industry is under stated in this report.

The graph below shows that since 2003 the total capital invested in land building and company shares has grown by $30b to $61.38b – a growth of 98%. It can be seen that the land value hasn't had a linear

increase in value and there has also been years when the value has decreased. The decreases in value haven't been caused from capital being diverted from the industry but from a revalue of fair market value for the units. This is proven by the fact that from 2006 the total area milked off increased from 1.4m ha to 1.65m ha by 2012.

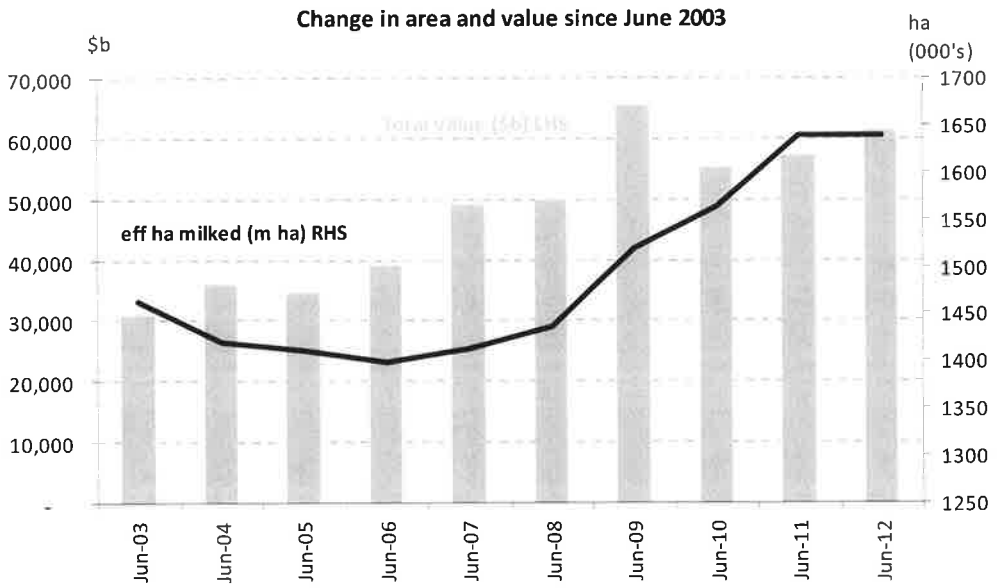

Figure 7: Change in eff milking platform area vs. change in total value since 2003 (source Dairy NZ, QVNZ)

The total area farmed has increased by 12% per ha and productivity per ha increase by 26% from 813kgMS/ha to 1,032kgMS/ha. These two factors alone don't explain the 98% increase in land value, therefore the per unit price must also have increased. Over the 10 year period the price per unit increased by 40% to $36.43 per kgMS.

The graph below demonstrates the relationship to milk price per kgMS and the sale price per kgMS over the ten year period which shows they are not very elastic in relationship.

Further on in the report it will be tested whether or not the increase in per kgMS sale price can be explained by an increase in profitability, not just revenue alone as this graph proposes. For example as previously explained using finance logic, more has been invested into asset value as future purchasing power has increased. The graph below suggests the value per unit follows milk price but lags by one year. There is a lag phase before the future earnings of a dairy farm flow through into fair market value. More so milk price may have no direct influence on the land value and it may be an indirect influence

which is impacting on land values. For example milk price may impact farmer confidence or availability of credit which in turn influences price farmers are prepared to pay for dairy farms.

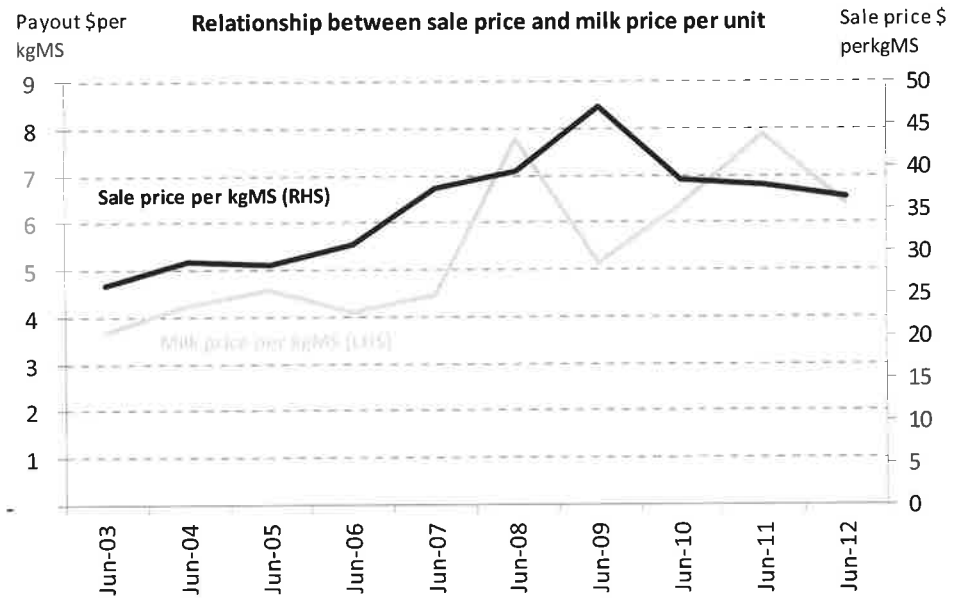

Figure 8: The relationship between sale price per kgMS and milk price kgMS (source DairyNZ)

Across the 10 years measured the land value has increase by 98% however it is the change in value between years which is of most interest. The graph below shows that the fastest rate of increase in land value was between 2008 and 2009 when the land value increased by 31%. This was subsequently followed by the largest decrease in land value when it decreased by 16%. Two out of the ten years there was a negative change in the land value, when the analysis is done on a per kgMS basis for the total land value. When the capital invested in land is determined using the median sale price per ha the same effect is found, for example, the largest increase in value between 2008 and 2009 was followed by the largest decrease between 2009 and 2010. As previously reported the large change in land value year on year doesn't have a strong correlation with milk price so there must be other variables at play. The largest changes in land value occurred leading up to a prior well documented credit crisis. Potentially this impacted in two ways on the land value and capital invested in the industry. Firstly, on confidence and secondly on the availability of credit. These two issues will be explored later in the report.

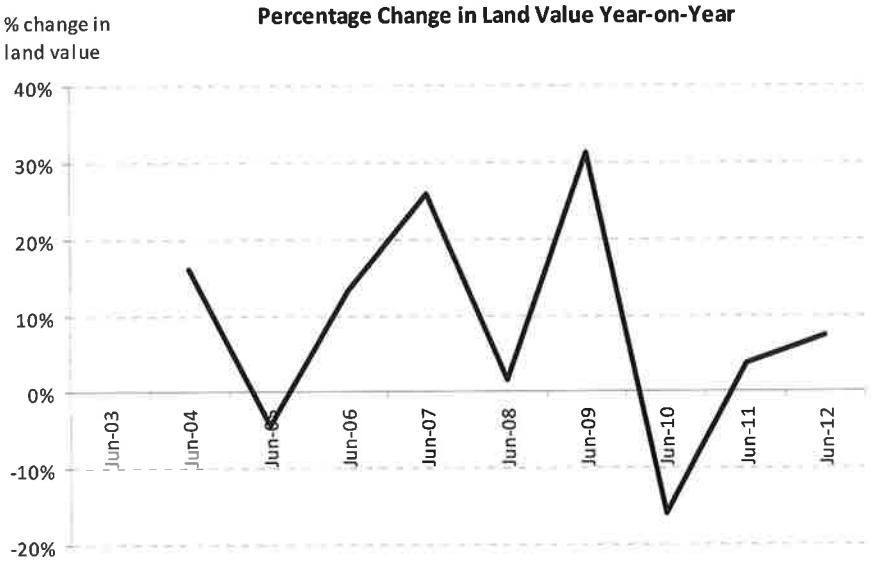

Figure 9: percentage change in land value year-on-year since 2003.

5.4 Total Capital Invested

Over the ten year period to 2003 the amount of capital invested in the dairy industry has increased from $35,936b to $75,016b. The largest percentage increase in capital invested has been from livestock which has increased by 229%. As explained previously this is due to increased numbers in the industry but more significantly and increase in value.

TOTAL CAPITAL INVESTED				
	Livestock	P, E & M	L B & Shares	Total
Jun-03	3,409	1,453	31,073	35,936
Jun-04	3,580	1,430	36,090	41,100
Jun-05	4,558	1,468	34,534	40,560
Jun-06	5,007	1,672	39,112	45,792
Jun-07	5,372	1,816	49,218	56,406
Jun-08	9,514	1,778	49,975	61,267
Jun-09	6,043	1,964	65,541	73,547
Jun-10	6,706	2,373	55,147	64,226
Jun-11	8,996	2,118	57,191	68,306
Jun-12	11,205	2,426	61,385	75,016

% Change	229%	67%	98%	109%

Figure 10: A breakdown of total capital invested in the dairy industry and the change since 2003.

The graph below shows the largest component of the capital invested in the dairy industry is from land, buildings and dairy company shares which make-up 81% of the total capital invested in the industry.

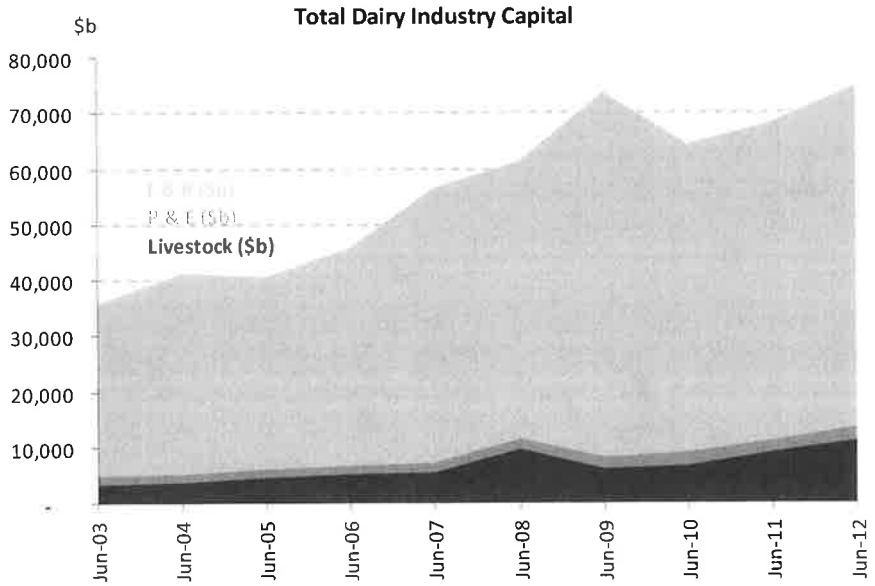

Figure 11: The change in total capital invested in the dairy industry since 2003

The figure below shows the relationship between the increased production in the dairy industry and increased capital invested in the industry. Over the ten years capital invested grew by 109% but production increased by 41%. Therefore the value per unit increased over the ten years. The value per unit increased 48% from $30 per kgMS to $45 per kgMS. As fundamental finance would suggest this value would have increased as the future earnings potential has increased.

Between 2003 and 2012 dairy payout has increased from $3.66 per kgMS to $6.40 per kgMS so what is the relationship between this increase in the payout and the increase in asset value. This was measured as a ratio between the payout and the asset value per kgMS. In 2003 the ratio was 8.24x and 2012 6.96x. This means that investor's perception of risk increased over time. It is often cited that the value of an asset is the mixture of the future earnings potential versus the risk of the likelihood of this actually

eventuating. The ratio decreasing over the period measured suggests that investors perception of risk increased overtime.

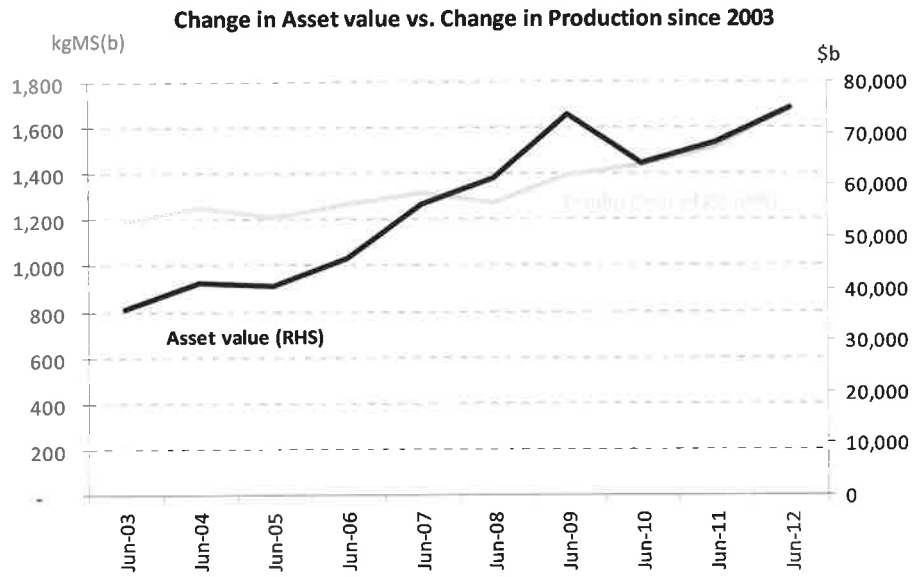

Figure 12: Change in capital invested in the dairy industry and change in total production since 2003.

6.0 DAIRY INDUSTRY DEBT

Since 2003 the amount of debt in the industry has grown by 187% from $11.29b to $32.37b. The fastest rate of increase in debt occurred in the earlier part of the century leading up to the financial crisis, peaking at an annual growth rate of just fewer than 30% per annum. Since then annual rate of increase in dairy debt has significantly slowed down to an annual change of less than 5% for the final three years.

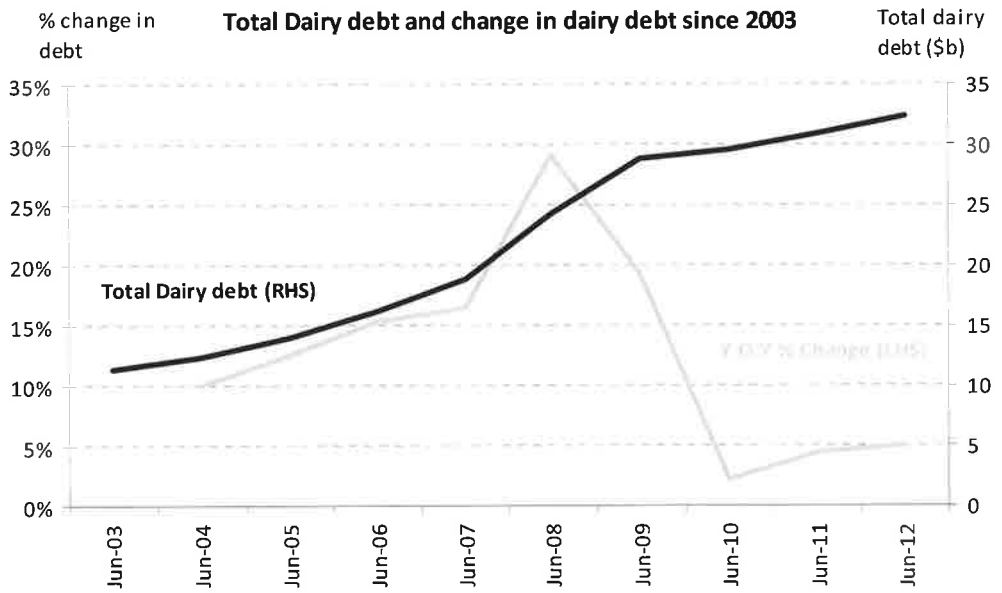

Figure 13: Total dairy debt vs the annual change in dairy debt since 2003

Leading up to the financial crisis debt and land values were increasing at a rate faster than increase total production as seen in the figure below. This is seen by the debt per kgMS increasing. It can therefore be surmised that the increase dairy debt and increased land values were hand in hand, which factor was causal is a debate that's hard to prove however it can be seen that additional debt capital invested into the industry wasn't used to grow just production but also inflate asset values. Since the financial crisis the opposite has been true. Whilst the debt per kgMS has stayed relatively flat the total production has increased. This has meant that since 2008 the growth in dairy debt has been to fund an increase in total production. This relationship will be tested further to see what happens when profit per ha is also included.

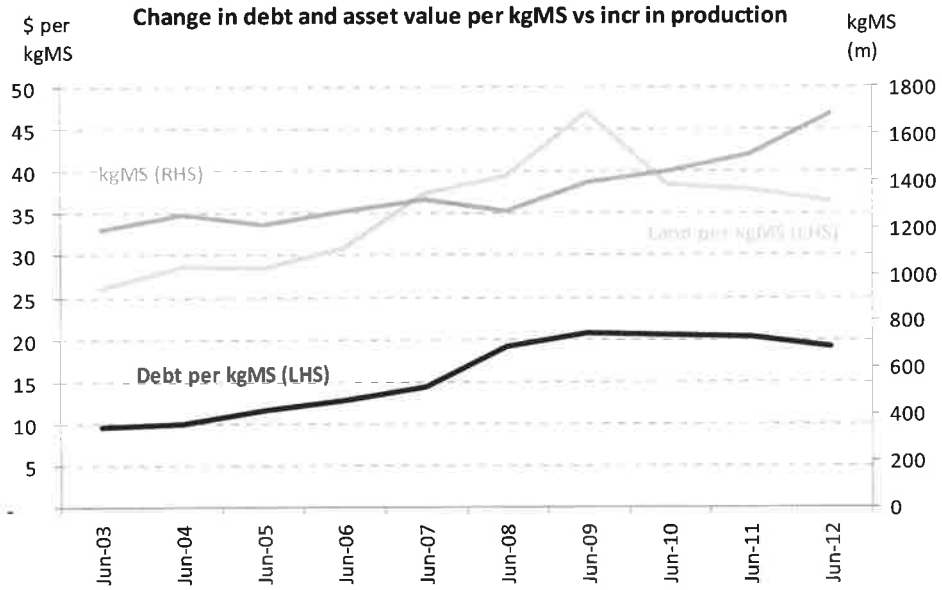

Figure 14: Change in debt, asset value and production since 2003.

It is well recognized that one of the issues with debt in the dairy industry is not so much the total amount but the distribution of the debt amongst individual farms. In 2007 and 2008 the average debt per kgMS was roughly $19 per kgMS however 20% of farmers had less than $10 per kgMS, a further 43% had between $10 and $19 per kgMS whilst almost 15% had over $30 per kgMS.

7.0 THE RELATIONSHIP OF DAIRY INDUSTRY EQUITY TO DEBT

Research Question: What is the breakdown of this investment between debt and equity?

DEBT TO EQUITY RELATIONSHIP ($b)				
	Asset	Debt	Equity	% change
Jun-03	35,936	11,290	24,646	
Jun-04	41,100	12,423	28,677	16%
Jun-05	40,560	13,979	26,581	-7%
Jun-06	45,792	16,112	29,680	12%
Jun-07	56,406	18,764	37,642	27%
Jun-08	61,267	24,232	37,035	-2%
Jun-09	73,547	28,896	44,651	21%

Jun-10	64,226	29,537	34,689	-22%
Jun-11	68,306	30,845	37,461	8%
Jun-12	75,016	32,374	42,642	14%
% Change	109%	187%	73%	

Figure 15: Debt to equity since 2003

Over the past ten years total equity in the industry has grown 73% from $24.65b to $42.64b The year on year growth in equity ranged from + 27% to -22% showing that owners equity was very volatile during the 10 year period. This was a direct result of land values, which as demonstrated before land made up 80% of the total capital invested and since the fair market value of dairy farms fluctuated by up to 30% it directly impacted farmers equity by similar changes.

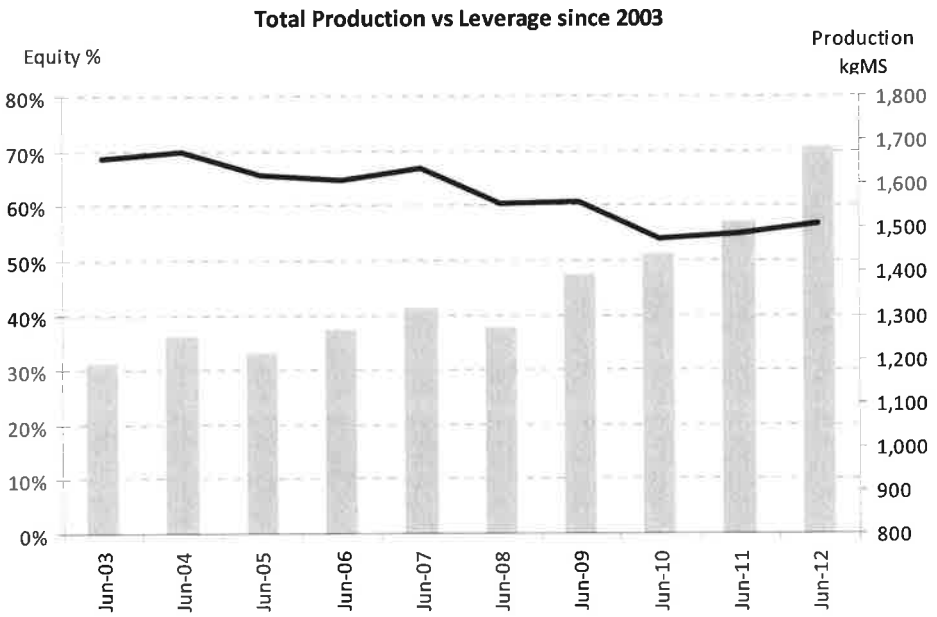

Figure 16: Change in production vs change in leverage since 2003

The percentage of equity to total capital has decreased from above 70% in 2003 to below 60% by 2012. This shows that the amount of leverage in the industry has increased over the past 10 years. Leading up to the financial crisis the increased leverage appears to have funded increased asset values and subsequently increased production. If rationale investments were made over this time then the increased leverage would have resulted in increased profitability. This will be tested in the next section of the report.

8.0 DAIRY INDUSTRY PROFITABILITY

Research Question: Has increased industry leverage resulted in increased industry profitability?

8.1 Dairybase profitability

Information for the profitability of the industry has been extracted from information out of the industry benchmarking tool, dairybase. This has a sample size of around 200 farms per year since 2003. This represents a sample size of less than 2% of the total industry. This information has been extrapolated across the industry to make some inferences about the industries profitability. Again due to the small sample size the error of the final result was large.

DAIRYBASE SAMPLE 200 FARMS					
	Income	F.W.E	Depr	Operating Profit	% Change
Jun-03	388,030	225,990	-28,851	133,189	
Jun-04	426,505	247,038	-31,167	148,300	11%
Jun-05	462,810	267,533	-33,795	161,482	9%
Jun-06	474,618	289,994	-37,308	147,316	-9%
Jun-07	519,251	320,115	-42,357	156,779	6%
Jun-08	897,049	450,842	-48,150	398,057	154%
Jun-09	679,455	468,201	-54,779	156,475	-61%
Jun-10	841,784	458,790	-56,330	326,664	109%
Jun-11	1,037,054	540,469	-58,898	437,687	34%
Jun-12	1,048,872	584,218	-52,172	412,482	-6%
% Change	170%	159%	81%	210%	

Figure 17: Change in operating profit since 2003 for dairybase farms (Dairybase)

The total farm profit for the Dairybase farms has increased by 170% driven by an increase in scale, productivity and payout. Since the start 2003 the sample average farm size has grown by 40% to 140ha and productivity per ha has grown from 895kgMS/ha to 1,052kgMS/ha representing an increase in productivity of 18%. Also the price received for product has increased 75% from $3.66 per kgMS to $6.4per kgMS by 2012.

This increase in income has come at a cost. Over the ten years farm working expenditure has increased 159%. Income has been growing at a rate faster than expenditure creating positive jaws which has resulted in a net increase in operating profit of 210% to $412,482. However, this profit has fluctuated widely with the profit increasing 154% between 2008 and 2009 and then decreasing by 61% the following year.

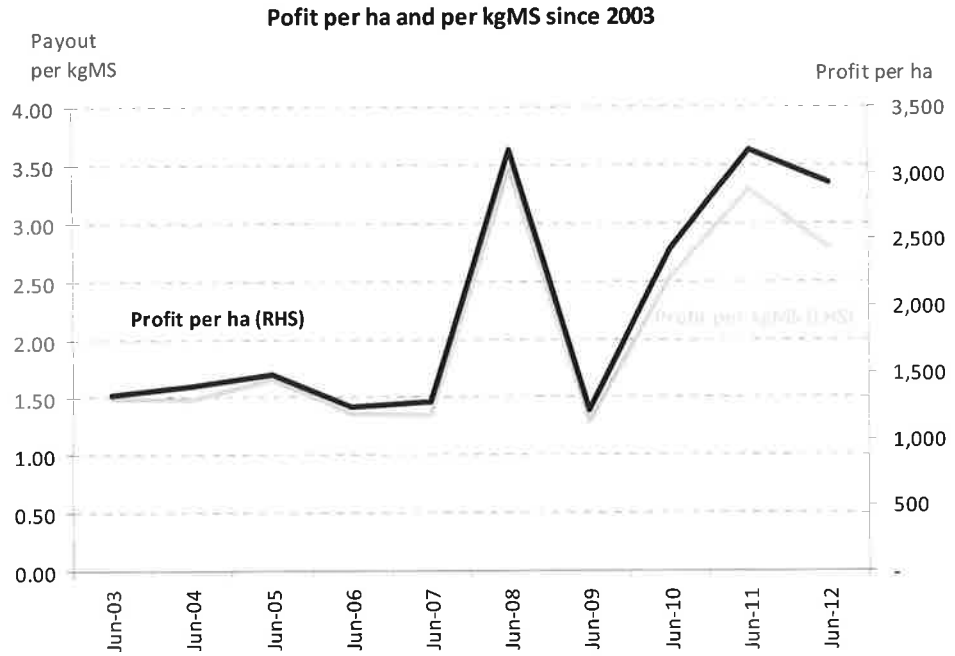

Figure 18: Profit per kgMS and per ha since 2003 (Dairybase)

The figure above shows what this trend of increased industry profit looks like when broken down into productive units, i.e. per ha and per kgMS. Leading up to 2007 the profit per ha and profit per kgMS were consistent at around $1.5 per kgMS and $1,400 per ha. Since then profits have been volatile but at a higher level. The profit per ha and per kgMS had a strong correlation apart from the last three years when the profit per ha has increased at a faster rate than the profit per kgMS. This is due to increased productivity per ha from improved pasture management, higher feed input, and higher production per cow. Over this time stocking rate has stayed generally consistent.

8.2 Distribution of Profitability

QUARTILE FARM PROFIT PER HA 2012				
	Bottom Quartile	Bottom - Middle	Top – Middle	Top Quartile
ha's	104	106	146	223
Cows	274	276	392	661
Cows / ha	2.6	2.6	2.7	3.0
kgMS/cow	357	371	367	402
kgMS/ha	936	1,019	1,000	1,214
OpEx $/kgMS	5.36	4.67	4.50	4.43
Op Prof $/kgMS	1.80	2.59	2.80	2.89
Op Prof $/ha	1,634	2,633	2,732	3,531

Figure 19: Quartile farm profit per ha for 2012 (Dairy NZ and Dairybase)

Overtime, as shown above, the mean profit for the industry is increasing however of more significance is the distribution of profitability. The table above shows the average profit per kgMS and per ha by quartiles for 2012. This shows that the top quartile is more than twice as profitable as the bottom quartile whereas the middle 50% are roughly the same. The top quartile are more profitable because of production per ha and operating expense per kgMS. This means that the top farmers are more efficient.

If all the operating profit was attributed to debt servicing at a 7% interest rate the top quartile could service an additional $15 of debt per kgMS. Assuming that the bottom quartile is profitable enough to service the current average debt (Current debt is $32.37b and production is 1.685b kgMS this means the average debt is $19.21 per kgMS). At a 7% interest cost this means the average debt servicing is 1.34 per kgMS which means operating profit of $1.8 for the bottom quartile is enough to service average debt), then difference of servicing an additional $15 of debt per kgMS means the industry could service another $25b of debt capital with no increase in production, so long as profitability increases.

DairyNZ information shows that profit per ha is normally distributed around the mean of $2,600 per ha with a standard deviation of $1,134/ha reflecting a very wide range between farms. Over the past five years the standard deviation has had a limited range of $900 to $1,200 per hectare meaning the range in profitability happens every year regardless of payout. Across the ten years, mean profit has ranged from $700 and $2,800 per ha. The issue this presents is that some years when the mean profit is at the lower

end of the range, the distribution of profitability means that a moderate number of farms do not make an operating profit.

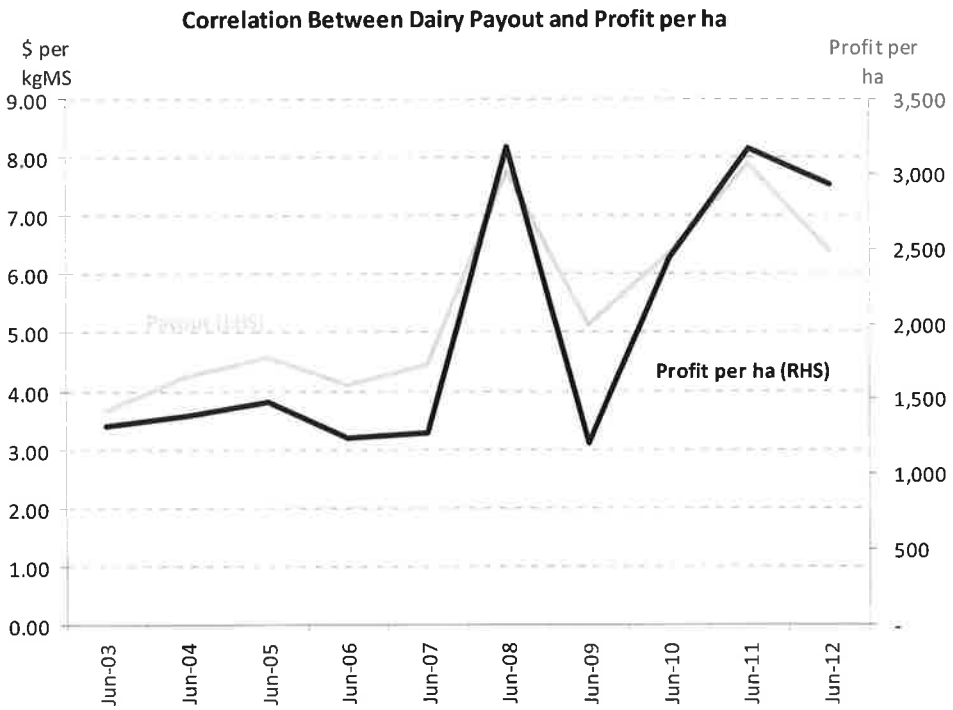

Figure 20: Correlation between dairy payout and profit per ha

The figure above shows the relationship to profit per ha and milk payout and it is shown to have a strong correlation. This makes sense given that milk income makes up over 90% of total revenues. For the first half of the 10 years, profit and payout had a tight correlation. However, once volatility in dairy prices set in over the final five years, profit per ha grew at a rate faster than the dairy payout and over the final year decrease at a rate slower than the decrease in payout. This means that farmers become more efficient at converting pasture into profit and didn't solely rely on payout to generate profit. Also the final year trend shows that farmers also responded well to price signals, managed to control costs and maintain productivity to keep profit per ha higher than the decrease in payout.

8.3 Total Industry Profitability

This Dairybase profits per ha and per kgMS have been extrapolated across the industry figures of eff ha milked and total kgMS produced. The results are shown in the figure below. They show that method of calculation doesn't cause a very big discrepancy. This shows that the total operating profit for the

industry has increased from under $2b in 2003 to just under $5b in 2012, peaking at above $5b in 2011. This shows a growth in operating profit of 150% across the period measured.

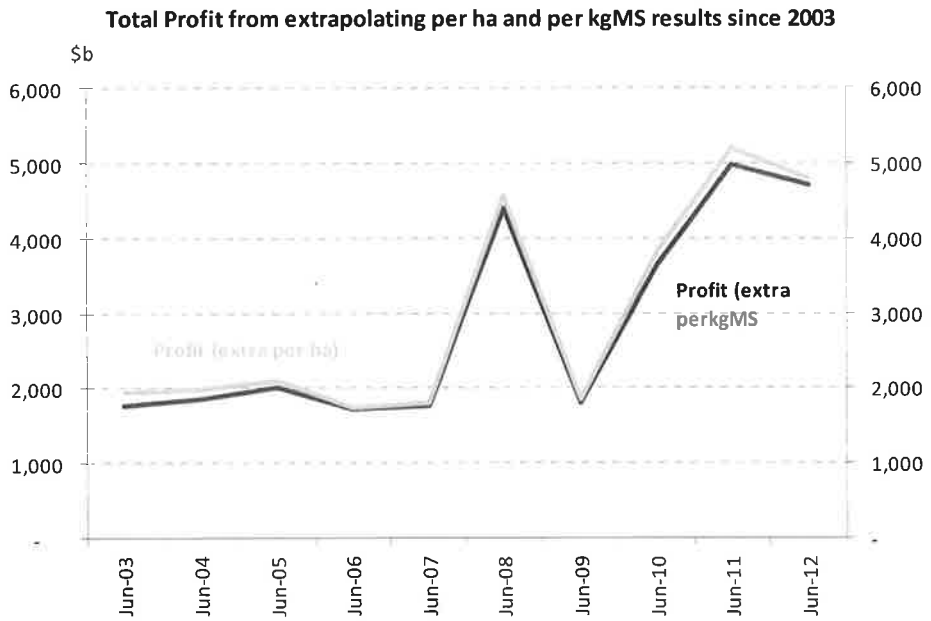

Figure 21: Extrapolated profit per kgMS and per ha for the industry since 2003

8.4 Relationship between capital invested and profitability

The figure below shows the relationship between the amount of capital invested in the dairy industry and total industry profit. It shows an interesting trend. There isn't a strong correlation between dairy profit and capital invested. Overall there was a relatively uniform increase in industry capital over the ten year period and profit changed in two distinct periods. Firstly, profit was flat over the first four years followed by a rapid growth in profit over the last three years, with an interruption in profit immediately before and after the global financial crisis. This trend has been shown with simple trend lines below.

If there was a direct correlation between the two, then the return on the capital invested would have been uniform. However, because profit was flat during the start but capital invested increased, the rate of return decreased. Subsequently, towards the end, because profit was growing at a rate faster than capital invested, returns were increasing. The rate of return on capital ranged from 3.2% to 7.6% peaking in 2010-11.

As the correlation between the two factors is poor it shows that fundamentally, profitability doesn't have a direct influence on the total capital invested into the dairy industry.

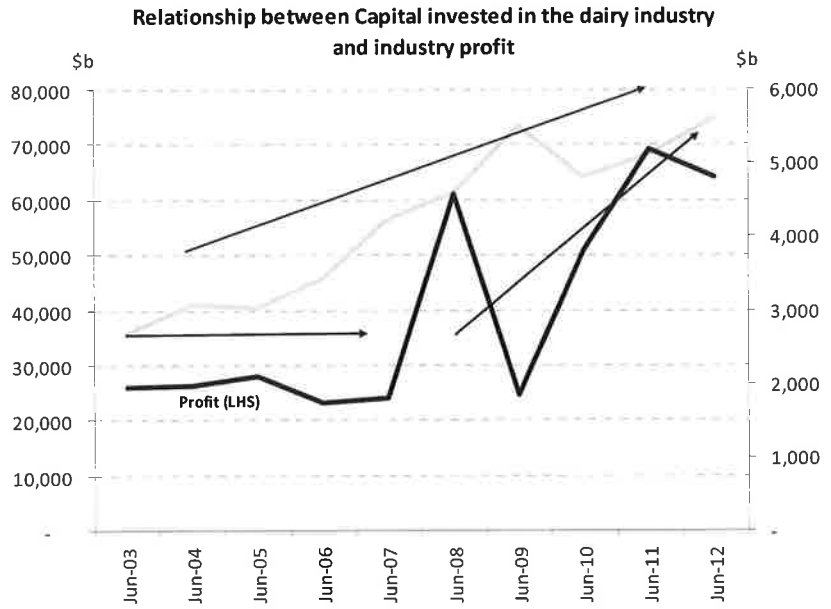

Figure 22: Relationship between capital invested and profit in the dairy industry

The figure below shows the total industry operating profit as a percentage of total industry debt. This was an attempt to understand if increasing industry debt was used to increase overall profitability – i.e. did increasing capital invested in the industry increase the return generated. If this was true then the operating profit as a % of total industry debt would have stayed the same as every dollar of increased debt would have increased profit by a proportionate amount. It shows an interesting trend. From 2003 to 2008 it shows that debt was increasing at a rate faster than profit. Since then however the result was reversed and profit grew at a faster rate than debt. This meant that by the end of the 10 years the operating profit as a % of total debt was similar to the start. I.e. as every dollar of debt increased, operating profit increased at the same rate over the ten years.

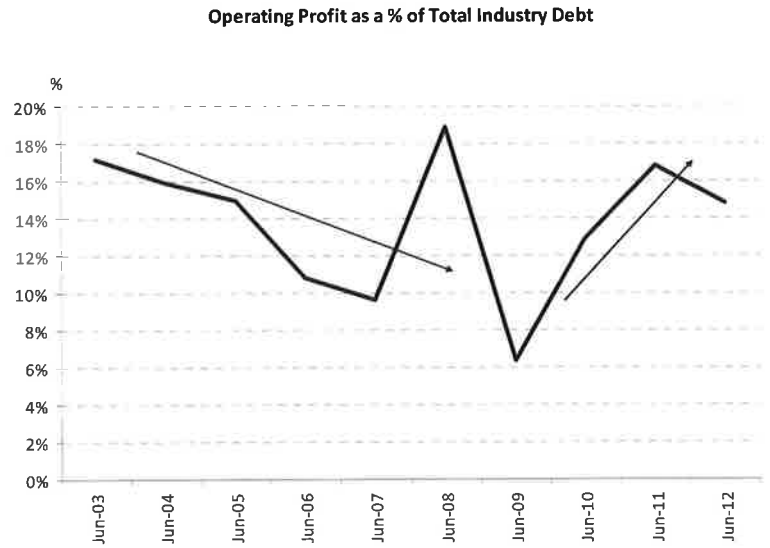

Figure 23: Operating Profit as a % of total industry debt

Therefore the conclusions that can be drawn from the previous two graphs is that during the first half of the 10 years dairy industry debt was used to fund increase asset value at a decreasing rate of return. Since 2009 profitability has grown at a rate far faster than the increase in asset value and debt. This means that debt was invested wisely to increase production not inflated asset values.

8.5 Return on Equity

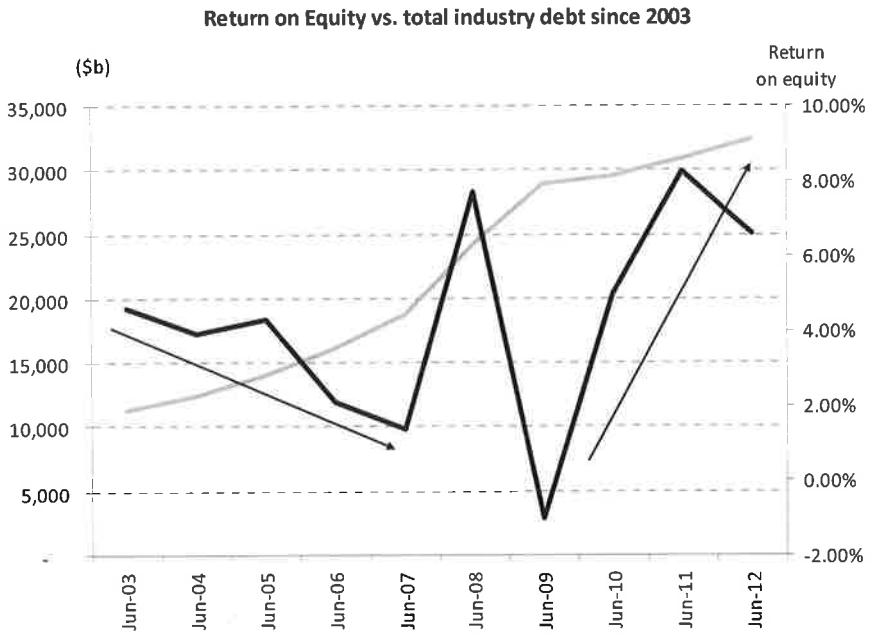

Figure 24: Return on equity vs. total industry debt.

The return on equity was measured across the ten years, by subtracting the interest cost from the operating profits already calculated and dividing it by the industry equity. An average interest rate for the debt was calculated again from Dairybase information. This showed a large range in return on equity from +7.70% to -1.40%.

Over the first five years the return on equity decreased. This was because the total industry profit was flat across the years but total industry capital and debt increased. Over this period there was an additional $20b of capital invested in the industry funded by $7.5b of debt and $12.5b of equity, over this time profit stayed constant at $1.75b, i.e. $20b of extra capital was invested in the industry at no additional return.

Conversely, since 2009 there was a $1.5b increase in total industry capital but an increase in debt by $3b (showing asset values per unit decreased) but profit increased from $1.8b to $4.7b. Overall, since 2009 this represents a 190% marginal return on marginal capital invested.

These results show only a cash return on equity and if the increase in asset values were also considered, then the rate of return on investment would be far higher.

This figure above shows that total industry debt shouldn't be considered in isolation about the vulnerabilities it can create. There are a number of competing issues that contribute to influence the vulnerabilities of the industry debt level and these are all factors that impact on the return on equity measured. These include, fair sale value, interest rate, payout, farm input costs, productivity, to name but a few.

8.6 Impact of Leverage

As suggested in the first section of the report, increased leverage can increase the potential profits generated but also accentuate potential negatives when revenues decrease. The graph below shows this potential positive and negative effect of leverage. As has been previously demonstrated leverage in the industry increased over the 10 years measured. In 2009 when the payout spiked, so did the industry profitability demonstrating the positive impact of leverage. However, In 2010 when the payout dropped conversely so did the return per kgMS. This shows the negative impact of leverage as even though the payout was higher in 2010 than the start of the period measured, the profit was lower.

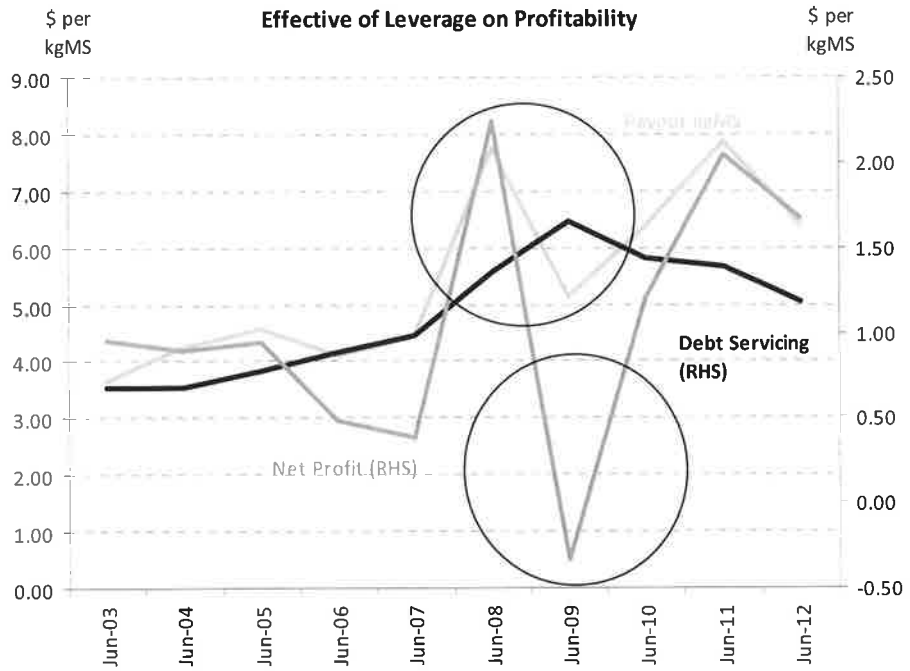

Figure 25: Graph to demonstrate the effect of leverage on industry profitability

8.7 Interest Coverage Ratio

Below is a table demonstrating the interest coverage ratio across the ten years measured. The interest cover ratio demonstrates how easily a company can pay interest on its outstanding debts. Therefore it is essentially a long term measure of solvency for a business. It was calculated by dividing the operating profits by the interest cost for the industry.

The lower the ratio the more the industry is burden by debt expense. A figure of greater than one shows that the level of operating profit is enough to meet all financial commitments. Only one year out of 10 was the interest coverage ratio below one. It is generally accepted that a coverage of over two or higher is considered adequate to protect creditors interest in the industry. During the period 60% of the time, the interest coverage ratio was above two. More significantly the interest coverage ratio was the same at the end of the ten years, when compared to the start. This shows that even thought the debt levels have increased by 187% the industry is technically no more vulnerable to changes in interest rates and payout prices.

INTEREST COVER RATIO	
	Times covered
Jun-03	2.40
Jun-04	2.31
Jun-05	1.55
Jun-06	1.39
Jun-07	2.66
Jun-08	0.80
Jun-09	1.84
Jun-10	2.48
Jun-11	2.42
Jun-12	2.42

Figure 26: Interest coverage ratio between 2003 and 2012

9.0 Does Profitability Fully Explain the Capital Allocation?

Research Question: What other factors could influence this allocation of capital in the past?

Profit isn't the only determinant of capital allocation decisions. This has been demonstrated above by the fact that there isn't a straight line linear relationship between the amount invested in the dairy industry and the profit generated.

People consider a multitude of factors when making investment decisions. This section considers other factors that could have previously influenced the way in which capital has been invested into the industry. These are important to consider as they will also be of importance in the future.

The first factor considered is competing land uses. It has been considered because land is limited in supply, therefore profitability of competing land uses will influence where capital is invested and what the acceptable rate of return is. For example, the National Sheep and Beef model produced by MPI for 2012 showed an average rate of return for the industry at 1.3% versus the calculated return in this report of 6.6% for the dairy industry. This difference in return could drive an allocation of capital to the dairy industry, away from sheep and beef. A change in land use is very capital intensive and since the previous profit has been low, there is limited savings to fund conversions. This has meant conversions to dairy have been funded by debt. Sheep and Beef farmers may be prepared to convert at an average

rate of return lower than the current industry average, as it is still an improvement compared to their current land use. Therefore, this could lead to an increase in industry debt with a declining trend in profitability.

It is generally accepted that a downturn in the economy such as the global economic crisis is amplified by reduced credit availability, which impacts corporate investment. The opposite is also true. Farming is not immune to these types of corporate issues so it can therefore be assumed that the availability of credit has impacted on the amount of investment into the dairy industry. There was a period leading up to the financial crisis defined by an abundance of cheap and accessible credit. This could have lead to marginal investment into the dairy industry that otherwise wouldn't have been made. Likewise since the credit supply has been tightened, investment decisions may have been limited by access to credit. Leading up to 2007 this research has shown that increased land values and increased debt were highly correlated with no obvious increase in profit. It is difficult to quantify, but availability of credit could have impacted on this i.e. as credit was readily available marginal investment decisions that otherwise would not have been made were allowed. Conversely, capital invested in the industry only grew by $2b from 2009 to 2012 and it could be surmised that this was due to a lack of available credit. Neither of these necessarily has been impacted by profitability.

Farmer's investment behaviour is also an interesting factor to consider. The New Zealand Agricultural Industry has a reputation of vastly increasing wealth through asset appreciation and not cash profit. This has been ingrained into a lot of farmers psyche and means that investment decisions can be made on the basis that land inflation will take care of poor cash profitability overtime. They have accepted a low rate of cash return and higher risk to profitability, as they have become wealthy by simply owning land and cashing in on the increased value in the future. Also farmers consider fair sale price to be what similar land has sold for, and often there isn't the same scrutiny given to the ability to generate profits. I.e. farmer behaviour in investment decisions often has no relevance to earnings potential.

Farmer confidence could have also explained the capital invested into the industry. If farmers view an investment into the industry as less risky than previously, then they would be prepared to accept a lower return. Was this the cause of lower return leading up to 2007? Did farmers consider that because the industry was less risky they were prepared to pay more for the land at a reduced profit? Also was this the reason for the opposite occurring after 2007, because more volatility was evident in the industry were farmers prepared to pay less per unit and demand a higher return on investment, as they viewed the industry as more risky due to volatility in payout? This perception of risk is very likely to have

influenced the investment decisions into the industry. Farmer confidence is influenced by a large number of factors including all factors contributing to profit (output prices, input prices, terms of trade, labour availability, global prosperity, commodity prices etc), regulation, weather events, competing land use, productivity and technology advancements to name a few. As a result, change to any of these factors leading to a subsequent change in farmer confidence will have a bearing on future investment decisions and the amount of capital invested in the industry.

The next factor considered is regulation. Regulation can artificially impact on market forces. Environmental regulation for example could be one of these factors. The impact of regulation on water availability for irrigation, nutrient leaching and general regulation limiting the land supply that can be dairy farmed on. If the amount of land is influenced by regulation, this will artificially inflate the value of existing dairy farms. The next type of regulation which could impact on investment is that of restrictions on foreign capital into New Zealand. If foreign ownership is restricted through regulation, then this reduces demand for farms and also reduces land values.

All of these separate issue no doubt impacted on the amount of capital that is invested into the dairy industry and also the acceptable rate of return that the industry has generated. More importantly some of these metrics which are the hardest to quantify will likely have the largest impact on the capital invested into the industry in the future.

Simply put there are a number of competing factors that interact to influence investment decisions. This is not meant to be a conclusive list of the factors that influence investment decisions and therefore the amount of capital invested in the dairy industry, but more an acknowledgement that factors other than direct profitability interact to determine the amount of capital invested.

10.0 CONCLUSIONS

Research Question: What conclusions can be drawn about what this means for funding future growth?

10.1 What has the past shown us?

Between 2002 and 2012 there are some very clear trends for the industry. The period can be simply summed up as the decade of increases. There has been:

- Increase in total production and productivity
- Increase in capital invested, debt and leverage
- Increase in profit, volatility of payout and volatility of returns.

The dairy industry has rapidly grown over the past 10 years with growth in production by 41% to 1.685b. This has resulted in the industry having far more capital invested in it increasing to $75b by 2012. Over the 10 years the profit of the industry grew to where it was generating an EBIT of $5b dollars per annum, this comes from more production, better productivity and higher payout. The growth of the industry has been largely funded by debt but over the 10 years incomes and values have grown at a rate faster than the debt. Balance sheets are only slightly higher geared and more importantly the solvency of the industry is on par to the start of the period. Overall, this shows that debt capital has been used successfully to grow the industry.

However within this 10 year period there have been three distinct periods, Phase One between 2003-2007, Phase Two between 2007-2009 and Phase Three between 2009-2012. It is consideration for these three separate phases which give lessons that can be used when considering how the future growth in the industry can be funded.

10.2 Phase One - 2003 - 2007

The first phase considered was between 2003 and 2007. The following interactions were observed during this time:

- Increased land values and therefore capital invested in the industry (+ 52% during this period)
- Increased debt (+ 42% in the period)
- Static production (+6% over three years)
- Static payout and profit, (average $4.15 + or - $0.5 and $1,900 per ha)
- Therefore reduced returns and increased solvency risk

The amount of capital invested in the dairy industry rapidly increased by about 12% year on year. This flowed through into increased land values which increased from $26 to $31 per kgMS. During this time production only increased by 6% or 76m kgMS. Debt increased by $4.8b, therefore marginal increase in

kgMS had a marginal increase of $63 per kgMS dollars of debt. At that time the total value per kgMS was $36, therefore over half of the increased debt during this phase went to fund inflated land values not just increase in total production. This demonstrates that capital was invested into the industry but allocated towards inflating asset values, not just increased production. This dynamic would have been feasible so long as the profit generated justified the increase in asset values. Over this period however the profit per ha actually decreased by $219per ha or 10%. Fundamental finance suggests that overall the industry was making poor capital allocation decisions.

People were prepared to invest more capital into the industry but accept a lower rate of return. This partially makes sense as the cost of capital on the debt decreased over these three years but not enough to outweigh the increase capital and reduced profit. This means that overall the return on equity invested decreased. This meant that diminishing returns were present, for example for every dollar of capital invested; it returned less than the previous dollar invested. There are numerous reasons why this could have occurred.

Furthermore, the solvency decreased over this period as well as a result of the increased leverage and reduced profit. This was shown by the reducing interest coverage ratio from over 2x to less than 1.4x. This left the industry vulnerable to changes in interest rates and payout.

The dynamics of the capital invested in the industry over this period were unsustainable, as even though the value of the industry was increasing the profit and solvency of the industry was decreasing. There is a limit to how far this trend could have continued.

Lesson learnt: The relationship between capital invested and returns generated over this period were unsustainable as capital invested didn't improve the profit of the industry.

10.3 Phase Two - 2007 - 2009

During the second phase the following trends were evident:

- Debt growing at it's fastest rate (+23% per annum)
- Asset values growing at there fastest rate (+16% per annum)
- Largest variation in payout (average $5.8 + or - $2.0)
- Profit per ha ranged between $1,800 and $4,700 per ha

- Return per ha ranged between +7.70% and -1.00%
- Shows the positive and negative impacts of gearing on the industry

This period had the largest amount of uncertainty for the industry. In 2007 the dairy payout rapidly increased from $4.46 to $7.76 per kgMS. This vastly improved sentiment in the industry leading to rapid investment, appreciating assets and increased conversions growing production. Over this period asset values increased from $31 per kgMS to $47 per kgMS.

This rush of investment was justified by the increased payout, as underlying profitability spiked to the highest level seen since before 2002. Profit increased from $1,800 per ha to $4,700 per ha at this time. The rate of return was strong at the higher payout, leading to additional debt capital being invested into the industry. The return on asset and equity increased from the mid 4% range to mid 7% range or as a whole, the net return after debt servicing increased from under $1b to just under $3b.

The following year the payout significantly decreased and profits tumbled demonstrating the vulnerabilities to changes in the payout. The payout dropped the following year from $7.76 to $5.14 per kgMS. The rate of return dropped and due to the higher leverage the industry didn't generate enough profit to cover its debt servicing commitments. This also created solvency issues for the industry. The payout of $5.14 was higher than the previous period average of $4.15 per kgMS but due to increased cost structures the industry profit was similar to when the payout was $4 per kgMS at around $1.4b. On top of this, the industry debt servicing cost had increased by 185% to $2.3b due to the surge of debt capital funding increased asset values. Between 2003 and 2007 the industry debt servicing cost had risen from under $1b to over $2b. Therefore when the payout dropped in 2009 the industry didn't generate enough income to service its financial commitments. This resulted in the only loss generated over the 10 years measured and the only negative return on equity – the loss was -$500m or -1.04%.

In essence this period demonstrated the relationship of positive and negative leverage. As seen in the period previous, debt capital has been used to grow the industry production and asset value. Positive leverage was shown in 2007 when due to the high payout; the rate of return on investments was far higher than the interest rate on the capital. This relationship fueled additional investment into the industry

Overall this phase showed that as industry leverage was increasing this magnified the positive potential profits when the payout spiked this also demonstrated that when the profit dropped back to a normal

range per ha, cash returns dropped due to increased financial commitments. Therefore to sustain the increasing leverage in the industry a higher profit per ha was required.

Outcome: Positive and negative risk of leverage due to volatility in payout – higher profit per ha required to sustain a return on amount of capital invested in the industry.

10.4 Phase Three - 2009 - 2012

Defined by:

- Fastest increase in production (+5% Y.O.Y)
- Debt growth at its slowest rate (+12% over the four years)
- Highest average payout and profit per ha ($6.8 + or - $1.0, profit $4,602 per ha)
- Asset value per unit stable (around $38 per kgMS)
- This resulted in industry profitability growing at a rate faster than capital invested increasing return on asset and equity and reducing solvency risk.

After the volatility of phase two, phase three was defined by a period of stable growth in capital invested and profitability which increased at a rate faster than capital invested.

Over this time debt increased by $3.45b and production increased by 292m kgMS, or at a debt cost of $11 per kgMS. As the average cost per kgMS for the total capital invested was $38 per kgMS this meant a portion of the increased production was funded by cash savings and or productivity was also rapidly increasing. Aside from how it was achieved the main factor of note is that total production was increasing at a rate faster than total debt. Because of this, debt per kgMS decreased over this period for the industry. It decreased from its peak of $21 per kgMS in 2009 to $19 in 2012.

Over this period profit per ha increased markedly from around $1,800 per ha to average $4,600 per ha over the three years. This was a function of payout and productivity increasing at a rate faster than farm expenditure.

A stable capital base, decreasing leverage and improved profits meant that balance sheets strengthened, return on asset and return on equity improved and solvency risk reduced.

Outcome: Sustainable relationship between capital invested and returns generated.

10.5 Potential capital required for growth?

The Green Pastures research produced by the ANZ Bank in 2012 estimated the amount of capital required to fund the opportunities for Agriculture in New Zealand and Australia. This research has shown that annual saving rate from profit will not be enough to fund the expansion of the dairy industry. This research has shown that the total profit for the industry has averaged about $1.45b per annum since 2003. If the industry is expected to continue to expand at 4% per annum and assuming that the growth in capital invested is linear to growth in income, then by 2022 there will be $111b invested in the industry or an additional $36b. If the total current average profit of $1.45b per year continued and was allocated to this growth, then there would still be a shortfall of $21.5b. If this shortfall is to be funded by debt the total debt in the industry would grow by 66% to $54b increasing the industry leverage to 49% from the current 57%.

There are lessons that can be learnt from the period between 2003 and 2012 for how this growth can be successfully managed.

10.6 What can be learnt from the period between 2002 and 2012?

The period between 2002 and 2012 shows that the growth of the industry can be successfully managed if the relationship between the amounts of capital invested and profit are maintained. The important factor isn't solely debt per kgMS, profit per ha, interest rates, payout or any other isolated factor but most importantly the interaction between all these factors. These factors relate to drive profit and solvency risk. As Phase Three above demonstrates, so long as the profitability grows at a rate faster than the cost of capital, then the type of capital funding mix is irrelevant. However, as Phase Two shows increasing the amount of leverage increases the risk to profitability through volatile payouts. Conversely, if the relationships that were present in Phase One persist for example capital is invested to inflate asset values at a rate faster than income growth, then there is a limit to the amount of debt the industry can sustain.

10.7 The effect of management

This research has found that accessing capital to grow the industry is dependant on the interaction between asset values and profitability. Therefore any factor that can improve profitability will increase the access to capital.

There is one crucial area which could be focused on to grow the industry and reduce vulnerabilities to debt level. This is opportunities to increase the profit of the lowest quartile of farmers up to the top

quartile. It is accepted that some of the difference is due to physical factors of the farm such as climatic features, or soil types, reducing pasture that can be grown. The greatest impact on this profit distribution is farmers' management ability. Improving this management ability generally won't require any additional capital invested but will result in far higher profit.

Using the distribution of profit from 2012 extrapolated results can be used to paint the size of the prize. In 2012 the bottom quartile of farmers had a profit per ha of $1,634 versus the top farmers of $3,531. This is more than double the top from the bottom. However the bottom quartiles of farmers are a lot smaller than the top quartile – meaning that far less than one quarter of production is with the bottom quartile. If the average profit increased to $3,531 per ha then this would have increased the overall industry revenue from $4.8b to $5.8b an extra 20% or $1b dollars. The industry profit in 2003 was only $1.8b so this is a sizeable increase from straight management factors.

If the industry generated revenue of $5.8b in 2012 then the return on asset and equity would have increased from 6.4% and 6.6% to 7.7% and 8.9% respectively. Conversely if the return on equity was to stay constant at 6.6% then an additional $1b could have been paid in debt servicing. This is the equivalent of an additional $16b of debt which is roughly twice the additional level of debt in the industry currently.

This is a simplified way to quantify the importance of improved profitability from management ability. Given the size of the numbers involved, it demonstrates that on farm factors are likely to be the largest determinate of future access to capital.

10.8 Summary

Overall there is no clear picture that explains how the industry should fund future growth. However, if some simple rules that have been defined as part of this research are followed, then access to capital to grow the industry shouldn't be a limiting factor. The key factor is the relationship between the asset values and profitability. Therefore, capital invested in the industry needs to be allocated to growth in productivity and if asset inflation occurs it needs to be at a rate slower than the growth in profitability. Being able to focus on the factors within farmer's control, namely management, will improve the overall access to capital for the industry.

To answer one of the key questions of this research, is the amount of debt in the industry an issue or a limitation to future growth then the answer is, it depends. Simply put, what is important is the relationship between, asset value, debt and profitability.

10.9 Research Limitations

There are numerous factors that influenced the accuracy of this research. This section discusses these factors and considers their effect on the overall results.

There is little data on the total capital invested in the dairy industry therefore a number of very broad assumptions have been used to calculate the result. As has been explained the differing methods for measuring the capital gives a difference in the results with a large magnitude of error. For example the method to value land gave an error of plus or minus 10% or $6b which is a significant error. A more robust valuation method would be required to reduce the amount of error in the research.

The method chosen to value the land and buildings disregarded the amount of capital invested in owned runoffs. It was a challenge to gather any meaningful information around the area of support land owned meant consequently valuing this land was impossible. A portion of the industry debt has been used to fund runoff's, meaning that the capital invested in the dairy industry is understated. It was decided that completely disregarding owned runoffs was more accurate than trying to determine a value for these.

Given the length of the history of the industry only, measuring the changes in the capital invested across 10 years is not long enough to build any clear trends that can be used to predict the long term future for the industry. To gather meaningful results it is proposed that at least 25 years would be required. This would increase the ability to understand trends and changes more clearly as it would place less importance on one off factors. The financial crisis is thought to have had a major influence in the trend between 2008 and 2010. Having a longer measurement period would have placed less importance on events such as these as they could have been identified as outlying results. Given the short duration of this research it was hard to quantify this period as an outlying result.

The figures used for the research were all in nominal figures with no allowance for inflation. The data would have been more accurate if adjusted to today's purchasing power. This therefore overstates the current profitability and capital invested in the industry and understates previous capital and profit. Inflation between the period of 2003 and 2012 has averaged around 2.7%. More importantly in the context of this research makes everY billion dollars of capital in 2003 worth $725m today roughly speaking.

10.10 Relevance to future research

The aim of this research was to understand the way in which capital has been invested in the dairy industry, how this has changed over the ten year period from 2003 to 2012 and what this potentially means for funding the future growth of the industry. To understand this accurately, further consideration needs to be given to the measurements used but more importantly the distributions within the industry. The use of averages shown in this research shows a clear picture of the overall situation but understanding the divergence of profit and leverage would add further value when trying to interpret what this could mean for the future.