

*Lessons from the*

## Angus Sire Benchmarking Program

# EBVS: INDIVIDUAL SIRE CHANGES

How much did each individual  
animals' EBVs change?





## Introduction

The Angus Sire Benchmarking Program (ASBP) has demonstrated that there is great potential to achieve genetic improvement in Angus breeding programs by utilising selection tools, such as TransTasman Angus Cattle Evaluation (TACE) Estimated Breeding Values (EBVs) and Selection Indexes.

A recent project undertaken by Angus Australia, with funding assistance from the MLA Donor Company, analysed whether the EBVs for each individual sire entered in cohorts 5, 6 and 7 when initially joined in the ASBP program differed considerably from the sire's EBVs at the end of program, by which time their progeny had been comprehensively performance recorded. The project builds on previous work which examined cohorts 1, 2 and 3.

This project has confirmed that while the EBVs for some individual sires did change, there was, on average, minimal change in the EBVs of the sires, and the initial sire EBVs, despite being of low accuracy, described the relative genetic merit of the sires well. Further, the number of sires for which the EBVs did change considerably, and the magnitude of the change in their EBVs, was within expected ranges.

## Background

The Angus Sire Benchmarking Program is an initiative of Angus Australia that aims to a) generate progeny test data on modern Angus bulls, particularly for hard to measure traits such as feed efficiency, abattoir carcase measurements, meat quality attributes and female reproduction; b) generates data for the validation and refinement of the TransTasman Angus Cattle Evaluation (TACE); and c) build a comprehensive phenotype and genotype database on Australian Angus animals for genomic technology validation, research and development. The ASBP program joins on average 40 sires a year to approximately 2000 Angus cows, to produce 25 progeny (50:50 steers and heifers) per sire using fixed time AI. In this program, the progeny of each sire are comprehensively performance recorded across a range of traits relating to fertility, weight, feed efficiency and carcase merit.

## Project Design

To determine if the EBVs of each individual sire when they were initially joined in the ASBP aligned with their EBVs when their progeny had been comprehensively performance recorded, the following steps were undertaken.

1. Initial EBVs: The TransTasman Angus Cattle Evaluation EBVs and EBV accuracies when the sires were entered into the ASBP were collated.

The EBVs for sires in each cohort were as follows:

- Cohort 5 - March 2015 TransTasman Angus Cattle Evaluation
- Cohort 6 - March 2016 TransTasman Angus Cattle Evaluation
- Cohort 7 - March 2017 TransTasman Angus Cattle Evaluation

2. Final EBVs: The EBVs and EBV accuracies for each individual sire once they had been progeny tested in the ASBP were collated. The "final" EBVs included comprehensive performance information obtained from the progeny of the sire in the ASBP, as well as other industry data.

3. Once both the "initial" and "final" EBVs and EBV accuracies from each individual sire had been collated, the "initial" EBVs and EBV accuracies of each sire were compared to their "final" EBVs and EBV accuracies, to evaluate how much change in EBVs and EBV accuracies had occurred.

It should be noted that several enhancements were implemented into the analytical software that is used within the TransTasman Angus Cattle Evaluation between when the initial and final EBVs were published. The most notable of these enhancements was the implementation of a new methodology for incorporating genomic information in the prediction of breeding value. Any effect of the introduction of enhancements to analytical software on the EBVs that are published has not been removed from this analysis.







## Results

For the purposes of this fact sheet, only the change in 200 Day Growth EBVs of sires in cohort 6 are presented, however similar findings were observed across other traits and cohorts analysed in this project.

### How Much Did EBVs Change?

Minimal change was observed, on average, in the EBVs of sires in cohort 6 of the ASBP for 200 Day Growth.

The average EBV of all cohort 6 sires when initially entered in the ASBP was +49 kg, whereas their average EBV of the sires once their progeny had been performance recorded was +49 kg, illustrating that there was, on average, no change in the 200 Day Growth EBV of cohort 6 sires.



Similarly, the average EBV of the 10 sires with the lowest and highest initial 200 Day Growth EBVs was +40 kg and +56 kg respectively, versus an average 200 Day Growth EBV once their progeny had been performance recorded of +43 kg and +57 kg.

**Table 1: Average 200 Day Growth EBVs for Sires in Cohort 6**

200 Day Growth (kg)	Initial EBV	Final EBV
Average Highest 10	+56	+57
Average of Cohort 6	+49	+49
Average Lowest 10	+40	+43



## How much did EBVs change for each individual sire?

While there was no change, on average, in the 200 Day Growth EBVs of sires in cohort 6 of the ASBP, the EBVs for some individual sires did change.

A comparison of the initial and final 200 Day Growth EBVs for each sire is presented in Figure 1. In this graph, the blue bars represent the initial EBVs of each sire when first joined in the ASBP, while the orange bars represent the final EBVs of each sire at the end of the project when all progeny performance data had been included in the EBV calculation.

While the EBVs for some sires increased, some decreased and some remained unchanged, there was not a significant amount of re-ranking observed. That is, the EBV of a sire who had a low initial EBV may have increased, but the sire's EBV would still be relatively low by comparison to other sires. With a small number of exceptions, bulls that started off with high 200 Day Growth EBVs also finished the program with high 200 Day Growth EBVs, while sires that started with lower 200 Day Growth EBVs also finished with lower 200 Day Growth EBVs.

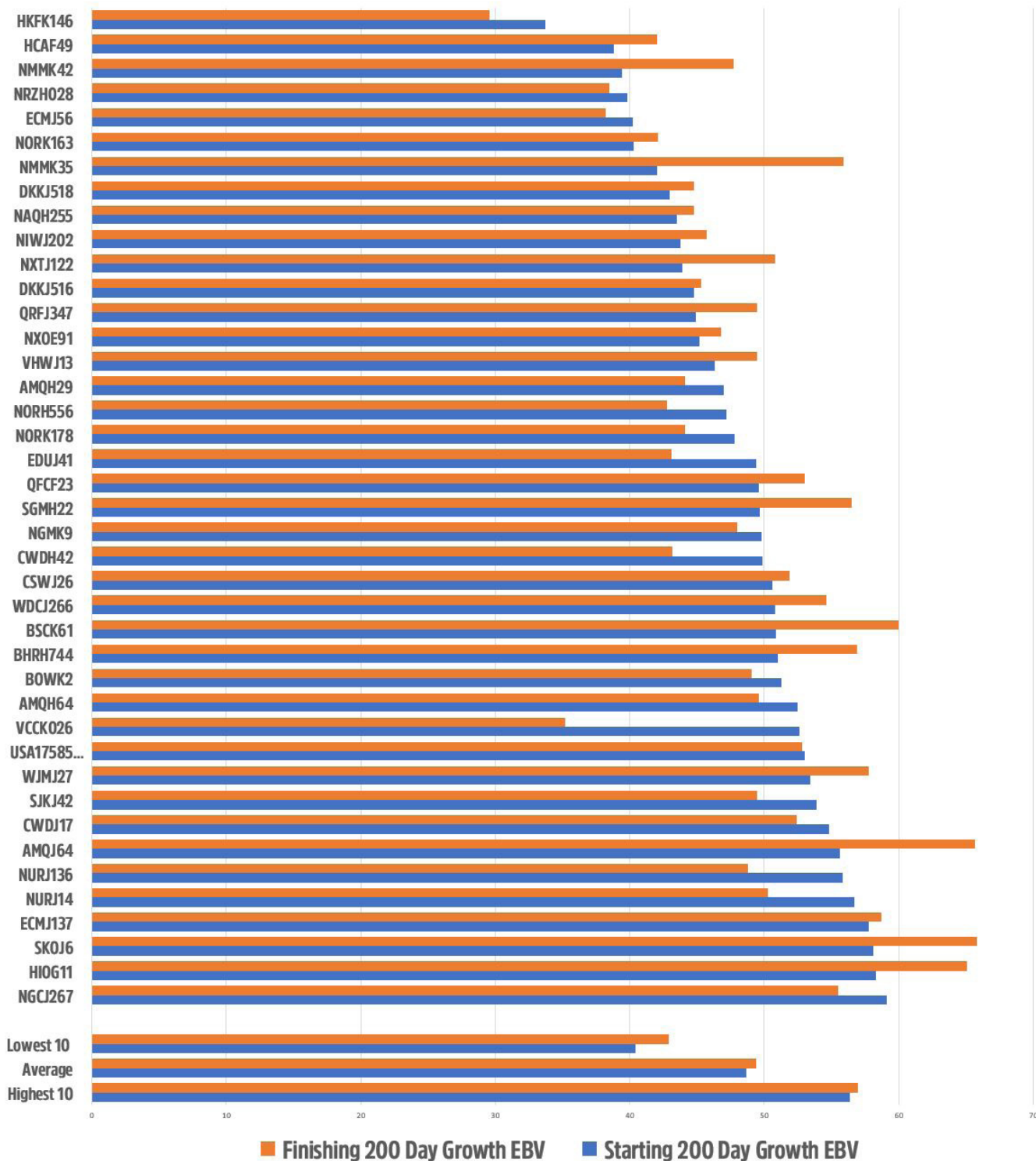


Figure 1: Starting Vs Finishing EBVs (Cohort 6 - 200 Day Growth)





### How Accurate Were the Initial EBVs of the Sires?

An accuracy figure is produced alongside each EBV, providing an indication of the amount of information used in the calculation of that EBV. The higher the accuracy, the more likely the EBV is to predict that animal's true breeding value and the less likely that EBV is to change.

The average accuracy for the 200 Day Growth EBVs of sires entered in Cohort 6 of the ASBP was relatively low at 75% (Table 2), indicating that some change in the EBVs of individual sires was expected when the sires' progeny were performance recorded.

**Table 2: Average 200 Day Growth EBV Accuracies for Sires in Cohort 6**

200 Day Growth (kg)	Initial Accuracy	Final Accuracy
Average Highest 10	75%	90%
Average of Cohort 6	75%	91%
Average Lowest 10	76%	92%



## Were the Changes in the EBVs of Individual Sires Within Expected Ranges?

The possible change in the initial EBV for each sire can be quantified by assessing the standard error of the EBV, with the standard error differing based on the accuracy of the sire's initial EBV.

The initial EBV for each sire is not expected to change more than one standard error for 7 out of every 10 sires. For the statistics enthusiasts, this is based on the distribution of expected change following a normal bell curve (Figure 2).

Upon analysis of the change in 200 Day Growth EBVs for each initial sire in cohort 6 of the ASBP, it was observed that the EBVs for 76% of sires (31 out of 41) did not change more than one standard error. The changes observed in sire EBVs (in standard errors) are displayed in Figure 3.

This bar graph demonstrates that there was slightly less change in the EBVs of individual sires than was expected (i.e. 76% v 68.2%), indicating that the changes in sire EBVs, were within expected ranges.

Further details regarding the change in EBV for each individual sire, relative to the change that was expected (1 standard error) is shown in Figure 4. In this graph, the red dots represent the final EBV, whereas the blue bars represent a range of 1 standard error outside the initial EBV for each sire. Sires with a smaller standard error are indicative of a higher initial EBV accuracy.

As described above, the EBVs were expected to remain within one standard error (blue bar) for 7 out of every 10 sires.

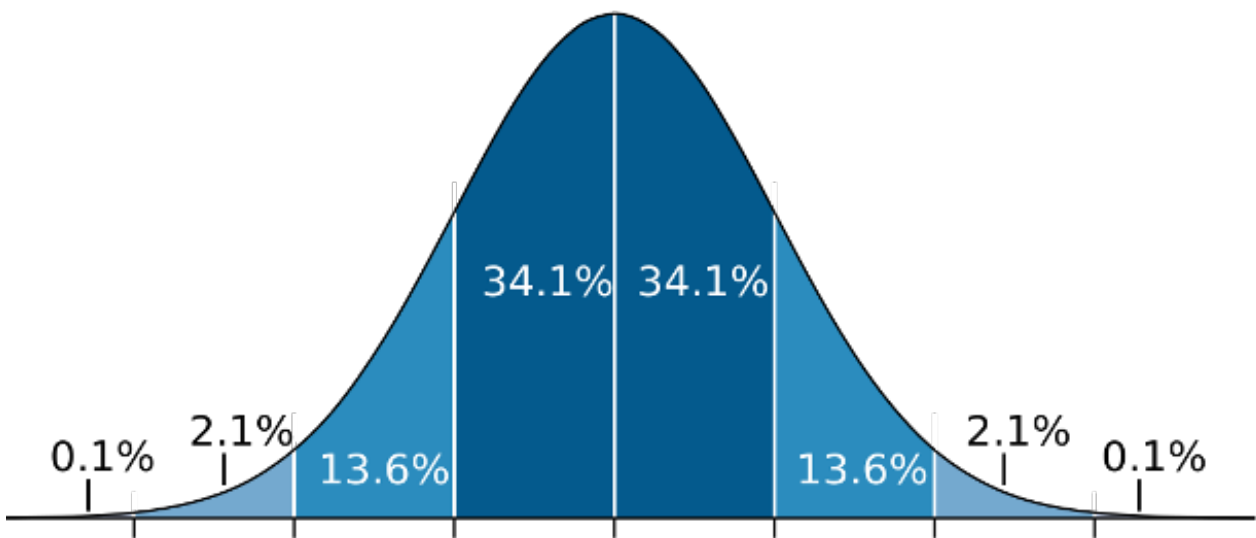


Figure 2: A Normal Bell Curve Distribution

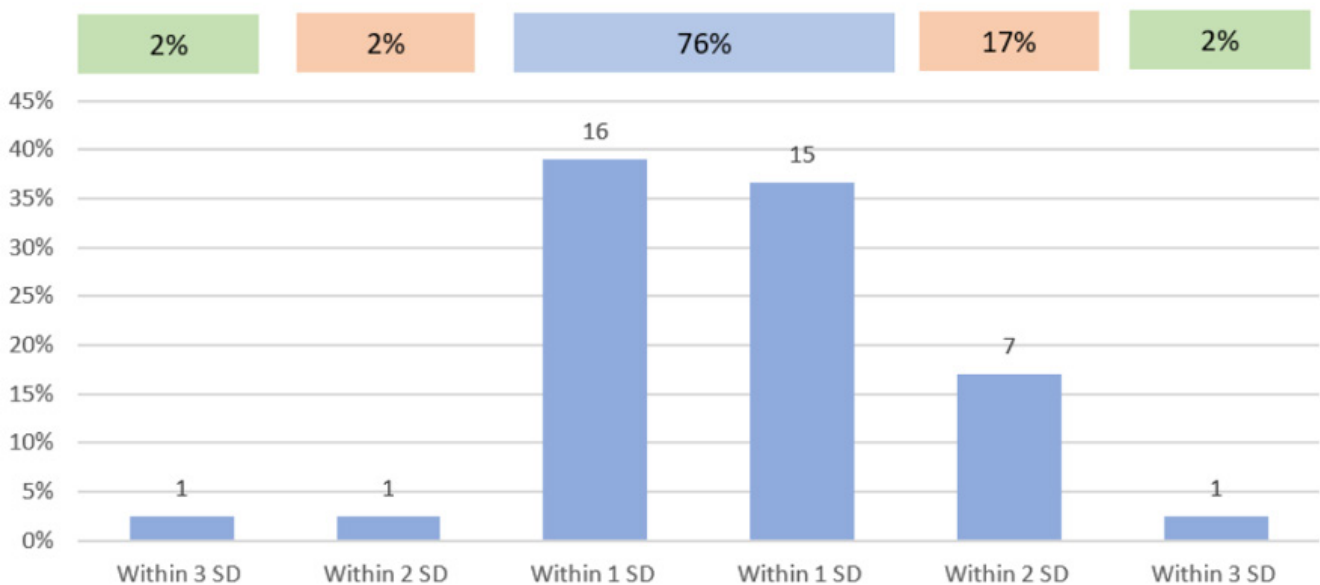


Figure 3: Change in Initial and Final EBVs (Shown in Standard Errors)



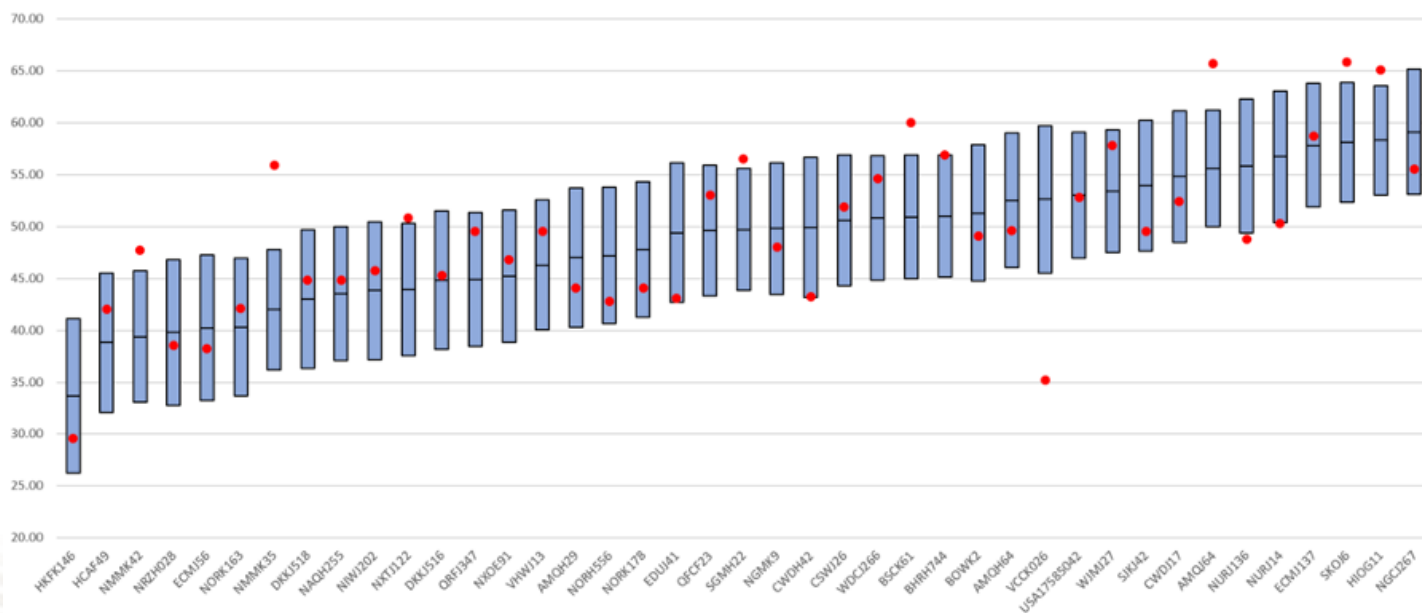


Figure 4: Change in EBV Expected (1 SE) vs Observed Change





## Conclusion

This project has shown clearly that there was, on average, minimal change in the EBVs of sires in cohorts 5, 6 and 7 of the ASBP, and the initial EBVs of the sires, despite being of low accuracy, described the relative genetic merit of the sires well.

The changes that were observed to the EBVs of individual sires, both in terms of the number of individual sires who EBVs changed, and the magnitude of those changes, were within expected ranges based on the accuracy of the sires' initial EBVs.

The outcomes from the project demonstrate that EBVs are a reliable selection tool, and beef producers should use EBVs with confidence to identify genetics that are most aligned with their breeding objectives, and in turn, to achieve long term, sustainable genetic improvement. Most sires will perform as predicted by their EBV, and

while some individual sires may perform better or worse than predicted by their EBV, the EBVs will on average, provide a reliable indicator of the genetics that sires are delivering to a breeding herd.



---

**For more information contact Angus Australia:**

02 6773 4600 | [office@angusaustralia.com.au](mailto:office@angusaustralia.com.au)

[www.angusaustralia.com.au](http://www.angusaustralia.com.au)



Angus Australia gratefully acknowledges the co-funding contribution from the Meat and Livestock Australia Donor Company