Econometric Validations & Augmentations

diversifiedspecifics

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Key Findings

Background

To accurately forecast segmented small and large letter volumes at Australia Post it is important to recognise there are two stages in the process:

1) Establishing an econometric baseline based upon historical associations; &

2) Augmenting that baseline with additional intelligence regarding one off events and emerging trends.

This validation report attempts to illustrate how the econometric and augmentation process must crucially combine to generate realistic volume forecasts for use in future price notifications whilst also enhancing managerial decision making beyond the econometric drivers of each letter volume segment at Australia Post.

Table KF1 highlights that, in the absence of further augmentation regarding one-off events and the emerging threats to mail, the econometric forecasts tended to over-estimate letter volumes (in aggregate) by 3.25%:

Table KF1 Primary Validations

Letter Volume Segment	Actual 08/09 Letter Volumes (mil)	09/10 Econometric Forecasts[1] (mil)	Actual 09/10 Letter Volumes (mil)	Econometric Overestimation (mil)
PreSort Small	2113	2053	2016	37
PreSort Large	162	154	149	5
Ordinary Small	1631	1602	1536	66
Ordinary Large	222	221	198	23
Total	**4128**	**4030**	**3899**	**131**

By way of illustration the two stage process this research undertaking utilises actual and projected letter volumes across the September Quarter of 2010 to highlight:

- The known associations as delivered through the econometric modelling process; &
- The areas of unexplained variation that require identification, collection and quantification through the augmentation process.

This research undertaking is intended to represent a commencement point for the econometric validation and augmentation process in line with recent advances in the international econometric and postal literature aimed at assisting Australia Post in their forecasting effort.

Australia Post will need to continue to cultivate additional mail data channels capable of generating further business intelligence to quantify and incorporate future events and emerging trends into the set of *ex-ante* forecasts.

Throughout the source documentation Diversified Specifics highlights areas where the existing data channels may be limited or new data channels may need to be considered to provide additional insights and facilitate the augmentation process. Diversified Specifics notes that change to existing or development of new data channels would also require an assessment of the associated practicalities, robustness of the outcomes and cost implications.

[1] Diversified Specifics (March 2010), 'Domestic Letter Segment Forecasts 2009/10-2011/12', Prepared on behalf of Australia Post. Econometric forecasts via Vector Error Correction (VECM) modelling techniques as reported in this Table are sourced from the following sections: PreSort Small (p.62); PreSort Large (p.67); Ordinary Small (p.58); Ordinary Large (p.65).

Augmenting the Econometric Baseline

When contrasting the econometric forecasts to actual small letter volumes in the September Quarter of 2010 the federal election is an example of a significant one-off event that may have inflated volumes beyond the models projections.

Therefore, the danger in interpreting the econometric forecasts at face value is that once positive and negative factors outside the model are discounted for it then allows a deeper investigation into the emerging threats to mail that may be beginning to suppress volumes beyond that anticipated econometrically.

Table KF2 Small Letter Growth Comparisons

September Quarter 2010	% Growth on Previous Quarter (SA)		
	Actual	Econometric Forecast	Augmentation Part 1*
Other Small Letters	-0.77%	-2.41%	-1.73%
PreSort Barcoded Small Letters	5.34%	1.77%	7.77%

** Augmentation 1 consists of the econometric forecast volumes plus the actual election related mail not embodied within the model.*

Table KF2 illustrates the following key points for the two small letter segments:

- Although the econometric forecast underestimates actual volume growth for the September quarter, once election related mailings are added to the econometric baseline the augmented forecast (in the final column) reduces the gap for Other small letters and overshoots the actual volumes considerably for PreSort Barcoded small letters;

- Of particular concern for Australia Post is the Part 1 augmented econometric forecast for PreSort Barcoded small letter volumes is based on historical associations and it "misses" very recent trends towards consolidation, rationalisation & bill presentment substitution.

- This is the X-factor that requires a second round of augmentation to better quantify and provide robust support for these emerging trends.

Table KF3 Large Letter Growth Comparisons

September Quarter 2010	% Growth on Previous Quarter (SA)		
	Actual Volumes	Econometric Forecast	Augmented Forecast
Other Large Letters	-2.37%	-2.02%	See Section 4
PreSort Barcoded Large Letters	18.54%	10.14%	See Section 5

With regard to the large letter segments the reasons for the variations (to PreSort Barcoded Large Letters) require further investigation. However, a possible influence is the recent QR National share market listing which represented the second largest float (behind Telstra in 1997) in Australian history and it is hypothesised that an associated substantial number of prospectus mailings would have occurred.

If this were the case then it could be expected to contribute in a major way to the PreSort Barcoded large letter quarterly volume growth that is in excess of the econometric forecast (8.40%) in Table KF3.

To adequately test this hypothesis though, further data channels may need to be cultivated to capture and quantify the mailings associated with one-off events such as the QR National float.

Only then may the clear impact upon actual volume growth for the quarter be incorporated into the adjusted *ex-ante* forecasts despite their exclusion from the econometric framework.

1.0 INTRODUCTION

1.1. THE SCOPE OF THE VALIDATION PROCESS

Stage one in the development of a robust set of segmented *ex-ante* letter volume forecasts involves the establishment of an econometric baseline.

These econometric forecasts are based upon historical associations between domestic letter segment volumes and a number of key drivers utilising Vector Error Correction Modelling (VECM) techniques. [2]

Diversified Specifics personnel, since 1997, have developed a robust methodology to generate baseline letter volume forecasts that are premised upon dynamic associations.

The ACCC's independent assessment in their most recent price notification stated in their report:

> *"Its (AP) consultant, Diversified Specifics (DS), has derived baseline econometric forecasts, based on best practice time series techniques for mail volume forecasting".*[3]

Of crucial importance however is that associations governing future letter volume fluctuations cannot be expected to mirror empirical movements across the forecast period as there may be a number of one-off events and emerging trends that will also have an impact on actual volumes. This is especially the case for the increasingly dynamic landscape characterising domestic and international postal industries in general.

Therefore, the segmented ex-ante letter volume baseline forecasts generated via econometric methods only have practical applicability once augmented by further internal and market-based intelligence.

Thus, augmentation represents a crucial second stage in the segmented letter volume forecasting process. Moreover, the combined effects of substitution, consolidation and rationalisation are likely to place increasing downward pressures on small and large letter volumes in future years.

This document attempts to illustrate the scope of what the econometric forecasts can explain and highlight the gaps that need to be addressed in the augmentation phase without entering into any technical explanations governing the models themselves.

It is important to note that this research undertaking is intended to represent a commencement point for the econometric validation and augmentation process in line with recent advances in the international econometric and postal literature ultimately aimed at assisting Australia Post in their forecasting effort.

In turn, Australia Post will need to continue to cultivate additional mail data channels capable of generating further business intelligence to adequately quantify and incorporate future events and emerging trends into the set of *ex-ante* forecasts.

Diversified Specifics notes that such changes would require an assessment of the associated practicalities, robustness of the outcomes and cost implications.

[2] The VECM methodology provides a general and flexible framework in which to capture the dynamics of letter volume fluctuations. The key feature underpinning this class of models is that it decomposes postal volumes in terms of long run and short run behaviour.

[3] Frontier Economics (2010), 'Review of Australia Post's volume and input cost forecasts: A report prepared for the ACCC', Public Version, p.iii.

1.2. CAVEATS AND CAUTIONS

The scope of this research undertaking focuses primarily upon outlining the issues and directions pertaining to future efforts to enhance the econometric baseline via additional data channels and market based research.

As such the scope of this analysis has certain limitations which necessitate a number of important caveats.

For instance, this research undertaking utilises a set of segmented letter volume vector error correction models however the associated diagnostics and statistical tests employed in their development are not presented here (although each of the preferred models are presented in Appendix A to this report).

Importantly, the econometric forecasts must also be recognised as a baseline to which further intelligence should be overlaid in order to ensure the projected letter volumes represent a set of robust and reliable indicators.

These caveats and cautions are briefly discussed within the remainder of this section.

1.2.1 Face Value Validation Dangers

Utilising data to June 30, 2010 Diversified Specifics forecasted segmented letter volume annual growth rates across the 2010/11 and 2011/12 financial years.[4]

From these projections the 2010 September quarter forecasts can be derived and are presented against actual letter volumes to September 30, 2010 in Table 1.2.1.

Table 1.2.1 September Quarter 2010 Actuals & Forecasts Validation

September Quarter 2010	Actual Volumes		Econometric Forecast	
	Volume (m)	% Growth on previous Quarter (SA)	Volume (m)	% Growth on previous Quarter (SA)
Other Small Letters[5]	373.514	-0.77%	367.350	-2.41%
PreSort Barcoded Small Letters[6]	544.785	5.34%	526.327	1.77%
Other Large Letters[7]	49.736	-2.37%	49.914	-2.02%
PreSort Barcoded Large Letters[8]	41.582	18.54%	38.635	10.14%

[4] Relevant technical information governing the derivation of the segmented *ex-ante* letter volume projections have been provided separately to Australia Post.
[5] The 'Other Small Letter' volume segment consists of full rate business mail, cheque payments and other consumer correspondence that satisfy the relevant small letter category size and weight requirements; the major products categories are Ordinary Letters and Clean Mail.
[6] The 'PreSort Barcoded Small Letter' volume segment consists of bulk (300+) lodgements of 1) Business transactional letter volumes such as bills, statements, share notices and letters advising customers of price increases, policy changes, etc; & 2) Direct mail including promotional letters, brochures and other addressed promotional material that satisfies the relevant small letter category size and weight requirements.
[7] The 'Other Large Letter' segment consists of full rate mail up to a maximum size, weight and thickness of 360x260mm, 500g, and 20mm respectively.
[8] The 'PreSort Barcoded Large Letter' segment consists of bulk (300+) lodgements of large letter mail that satisfies the relevant large letter category size and weight requirements.

It is important to recall at this stage that the econometric forecasts contained in Table 1.2.1 represent only a baseline as determined by historical associations over which further intelligence on one-off events and emerging trends must be overlaid.

The danger in interpreting Table 1.2.1 at face value is the actual volumes tend to possess more upside than the forecasts however once factors outside the model (such as the federal election) are discounted for a very different picture begins to emerge.

Sections 2 to 5 in this document outline, for each letter segment, the known associations as delivered through the econometric modelling process and identify some areas of unexplained variation that require identification, collection and quantification through the augmentation process.

1.2.2 Sampling Errors

Accurately forecasting letter mail volumes is also directly dependent upon the precision of projecting the actual growth rates associated with each of the demand drivers comprising the system of equations.

Although such differences are acknowledged and reported in the various sections of this document the ultimate impact upon the ex-ante forecasts are not explicitly reported here as the scope of this research undertaking rests on examining the role of the augmentations rather than ratifying any naturally occurring econometric sampling errors.

1.2.3 Technical Caveats

Technically, the analysis into some off-model events explored in the later Sections of this document should also be attended to by further statistical tests surrounding the estimates of the short and long run elasticities however further information on data availabilities at Australia Post are still being explored at this time.

For example, the exact letter volumes attributable to the most recent Federal election were captured by Australia Post and illustrate how the improvements in mailer data channels can aid the augmentation process.

However, the addition of 2010 Federal election mailings as an overlay onto the econometric baseline should also involve an incorporation of previous Federal election letter volume effects into the adjustment process.

This would also facilitate investigations that extend beyond the deployment of a dichotomous variable. That is, identifying whether the impact from Federal elections is observably consistent over time (eg. an increase / decrease in the usage levels of associated addressed mailings) and whether the type of election (eg State v Federal) has an impact.

1.3. INTERNATIONAL STUDIES

A key facet of econometric models stems from the ability to use such models to derive baseline *ex-ante* volume forecasts, which are premised on historical volume demand driver associations. A limitation of the econometric approach is the reliance of such models on historical revealed preference volume data observations.

Global postal markets, including the Australian postal industry, are being increasingly confronted with new challenges such as electronic substitution, rationalisation of billing cycles and the consolidation of multiple mail items into a single letter. Traditional historical associations are consequently being tested by the emergence of new factors.

In light of this, econometric models are limited to producing baseline forecasts that must be supplemented with additional market-based intelligence, in any attempts to account for significant new and emerging volume impacts.

At the cutting-edge of the postal economics literature there is a suggestion that it is becoming increasingly salient in today's evolving postal markets to augment the econometric baseline forecast with relevant market intelligence.

In a seminal study, Fève et al. (2010)[9], identify that forecast periods that differ from historical periods due to new and emerging impacts (such as those that characterise postal markets across the globe), can be enhanced by augmenting standard econometric forecasts by:

(i) Iteratively updating econometric models as new volume data becomes available; and
(ii) Melding the model outcomes with findings from relevant other market information.

Notably, Fève et al. (2010) identify the following sources of information as potentially important tools to augment econometric baseline forecasts:

(i) Market research that is focused on consumer switching behaviour i.e. stated preference and contingent valuation methodologies;
(ii) Business expert opinion using internal (i.e. postal operator) data, other business information and accumulated knowledge; and
(iii) The experiences of internationally comparable postal markets.

Fève et al. (2010) demonstrate that market research may be used to provide estimates of likely business and consumer mail demand behaviour over time and into the future, where such data is lacking. It is also suggested that panel studies (i.e. cross-sectional time-series studies) may be used to track changes over time.

In another study, Cazals et al. (2010)[10] show that market surveys may also be used to provide insight regarding letter mail content type.

In this study, market surveys were used to derive letter mail volume shares by content type i.e. social mail, direct mail and commercial mail. Content type econometric models were then developed to enhance forecasts emanating from econometric models.

[9] Frédérique Fève, Jean-Pierre Florens, Frank Rodriguez and Soterios Soteri (2010). 'Forecasting Mail Volumes in an Evolving Market Environment', in M.A. Crew and P.R. Kleindorfer (eds), *Heightening Competition in the Postal and Delivery Sector*, Edward Elgar Publishing Ltd, pp. 116-134.

[10] Catherine Cazals, Jean-Pierre Florens, Leticia Veruete-Mckay, Frank Rodriguez, and Soterios Soteri, (2010). 'UK Letter Mail Demand: a Content Based Time Series Analysis using Overlapping Market Survey Statistical Techniques', Toulouse School of Economics Working Paper Series, 10-170.

Moreover, Cazals et al. (2010) stipulate that letter mail econometric forecasts related to markets where significant uncertainties exist (e.g. future impacts of electronic substitution) should be augmented with what is referred to as "off-model additional net trend adjustments (ANTAs)".[11]

In an earlier study, Cazals et al. (2008)[12] emphasise that attempts should be made to modify econometric letter volume forecasts where structural market uncertainties exist within postal markets.

One avenue that is suggested to achieve this modification is based on expert knowledge and relevant business information.

This is particularly relevant for the Australian postal market, given the degree of uncertainty surrounding future levels of electronic substitution, consolidation and rationalisation.

Furthermore, important persistent events and structural policy changes require a degree of robust quantitative estimation to enhance the econometric volume baseline forecasts in order to aid with future decision making.

Significant differences amongst postal markets worldwide are also emerging and the principle argument of research conducted by Nikali (2011) focuses on one aspect of these divergences by suggesting that it is almost impossible to define let alone measure substitution of letter volume demand in an aggregate sense.[13]

Rather, the Nikali research conceptualises a corrugated substitution diffusion curve against a backdrop of a Finnish bill payments environment that is very similar to the Australian case.

That is, whilst the substitution of transactional mail in Finland has occurred on the bill payments side of a transaction this has not, as of yet, been mirrored on the bill presentments side of a transaction.

Nikali reports that this is not the case in Denmark where there are dual substitutive effects occurring on both sides of the transaction.

Indeed, paper bill presentment mail in Finland is 83% of total invoices whilst in Denmark the proportion of paper based invoices rests at 32%.

This leads Nikali to highlight that between 2000-2009 letter volumes decreased by 29% in Denmark as compared to 9% in Finland.

Technological diffusion inconsistencies such as these combined with changing mailer behavioural dynamics have led Diversified Specifics, since 2002, to publically reiterate the need for augmentation:

> *'Should the models be utilised for forecasting purposes it is essential that they are accompanied by intelligence that accounts for the emergence of consolidation, rationalisation, pricing and substitution effects.*
>
> *Whilst these effects are likely to emerge and have a significant impact upon future letter volumes, the lack of tractable data sets for each necessitates augmentation.'*[14]

[11] ibid

[12] Cazals, C., J.P. Florens, F. Rodriguez and S. Soteri (2008). 'Forecast uncertainty in dynamic models: an application to the demand for mail', in M.A. Crew and P.R. Kleindorfer (eds), Competition and Regulation in the Postal and Delivery Sector, Edward Elgar Publishing Ltd, pp. 63-73.

[13] Heikki Nikali (2011), 'Does the Level of Price Elasticity Change With the Progression of Substitution?', in M.A. Crew and P.R. Kleindorfer (eds), Reinventing The Postal Sector In An Electronic Age, Edward Elgar Publishing Ltd.

[14] Diversified Specifics (2002), 'Executive Summary: Small letter Volume Analysis: A report conducted on behalf of Australia Post', Public Document, p.6

The augmentation of *ex-ante* forecasts undertaken by Diversified Specifics and presented in this document therefore utilises post-forecast period internal volume data (i.e. September quarter 2010 data) as an illustrative example of how the econometric baseline forecasts might be validated and then enhanced accordingly.

Although this document is intended to represent a commencement point for validation and augmentation in line with such movements in the international postal literature, Australia Post will need to continue to cultivate additional mail data channels capable of generating further business intelligence to adequately incorporate future events and emerging trends into the set of *ex-ante* forecasts.

2.0 OTHER SMALL LETTERS

2.1.1 Background

Over the past year Other small letter volumes have been declining at 3.90% which is greater than the annual average decline of 2.78% evident since 2000/01.

During the course of the past decade Other small letter volumes have not registered a statistically strong association with the level of economic activity.

Any linkage has tended to be crowded out by a sustained behavioural change on the part of mailers as they developed a greater propensity towards utilising electronic alternatives to the traditional mail item on the bill payment side of a transaction.

These alternatives have traditionally evolved not in line with the emergence of each communication medium but rather the penetration and take-up of various bill payment modes, including phone and internet banking.

Recently though, the global financial crisis (GFC) illustrated how an increasingly volatile economic climate can reaffirm the traditional association between levels of economic growth and all letter volume segments.

Indeed, the response of Other small letter volumes to the GFC has necessitated two fundamental changes to the way substitution is accounted for within the econometric model:

1. In cases whereby domestic economic growth levels are especially low it appears that the linkage becomes stronger as there are noticeably fewer bills to be paid via the traditional mail item and, perhaps, mailers in general develop a greater propensity to seek out bill payment alternatives as they become increasingly cost conscious at lower levels of income; &

2. Formerly credit card numbers (ie. the total number of credit cards issued) were utilised to proxy movements towards substitutive bill payment mediums (i.e. credit cards acted as the conduit to enable these technologies). However, with the GFC the growth in the number of credit card accounts stalled not due to declining substitution away from the traditional mail item but rather as a consequence of a tougher economic climate (reducing the appetite for credit from both the provider and the user).

Cheque volumes are now utilised as the main indicator of continuing bill payment substitution within the econometric model due to a direct association with declines in usage away from the traditional mail item. This variable was always the first preference for measuring these effects however its utilisation in an econometric framework was previously hampered by a lack of sufficient observations.

2.1.2 Recent Trends

Table 2.1.2 utilises movements in the drivers detected through the econometric analysis to explain in part why the actual Other small letter volume decline in the past year (-3.90%) has been in excess of the annual average decline (-2.78%).

Specifically, Table 2.1.2 highlights:

- **An increasing movement towards substitutive technologies to the traditional mail item.** Cheque volumes have declined by 12.3% in the past year compared to an average annual decline since 2002/03 of 8.59%; &

- **The importance of price effects.** A recent increase in the nominal price attributable to the basic postal rate has naturally softened Other small letter volume demand.

  Diversified Specifics investigations into the Impulse Response Functions (IRFs) associated with historical price increases tend to highlight an initial downward inelastic response in volumes in the first quarter following a price increase.

  The analysis also stresses lagged price effects are still prevalent in subsequent quarters albeit at an increasing inelastic response rate.[15]

Table 2.1.2

Key Drivers: Other Small Letter Volume Model		
Variables	**Rolling 12 Month Growth Rate#**	**Average Annual Growth Rate (2000/01 - 2009/10)**
Other Small Letter Volumes	-3.90%	-2.78%
Cheque Volumes	-12.30%	-8.59%*
Credit Card Volumes	2.17%	4.83%
Real Price of Other Small Letters	6.13%	-0.53%

** The cheque volume annual average is calculated based upon a commencement date of 2002/03.*

 # The rolling 12 month growth rate is reflective of the timeframe spanning: September 30, 2009 to September 30, 2010.

[15] Impulse response functions represent a summary of how a variable reacts over time to an exogenous shock. Results from this analysis are not presented here as it is beyond the scope of this research undertaking.

2.1.3 Demand Driver Forecast Accuracy – Other Small Letter Volumes

The ability of the econometric models to accurately forecast letter mail volumes is a direct function of the accuracy in projecting the associated demand drivers within the system of equations.[16]

Any errors in these projections will directly impact the accuracy of the *ex-ante* volume forecasts generated via the model.

To provide an example, the projected and actual growth rates associated with each Other small letter volume demand driver for the September quarter of 2010 are presented in Table 2.1.3.

Specifically, forecast quarterly growth rates and actual quarterly growth rates are presented for:

(i) Cheque volumes; and

(ii) The real price of Other small letter volumes.

Table 2.1.3

Period	Cheque Volumes		Real Price of Other Small Letters	
	Projected Quarterly Growth Rate[17]	Actual Quarterly Growth Rate*	Projected Quarterly Growth Rate[18]	Actual Quarterly Growth Rate
Sep 2010	-2.90%	-2.10%	8.53%	8.00%

**Seasonally adjusted value*

The 2010 September quarter projection of cheque volumes employed in the econometric forecasts was premised upon recent Reserve Bank of Australia data which suggested a quarterly decline of -2.90%.

The actual decline in cheque volumes for the quarter registered -2.10%. As such, actual cheque volumes declined at a rate less than projected across the September quarter.

The implication is that the econometric model understated the actual amount of Other Small Letter volumes.

The actual 2010 September quarter Real Price of Other small letters, which is negatively associated with Other Small Letter volumes, was less than that projected by Diversified Specifics.

[16] These naturally occurring econometric sampling errors are acknowledged in this section however are not explicitly generated as the scope of this research undertaking is to focus primarily on the process of augmentation.

[17] The cheque volume quarterly projections employed are based upon the 12 month decline from June 2009 to June 2010 of 11.61% in the total number of cheque volumes – Sourced from: Cheques and Direct Entry Payments - C6, Reserve Bank of Australia.

[18] Quarterly real price projections are based upon financial year data generated utilising: 1) CPI projections from Alan Marshall, 2009/10 Planning Cycle - Economic Outlook, 20 November 2009, Australia Post of 2.25% for 10/11; & 2) A nominal price increase of 9.09%.

Despite an increasing downside to Other small letter volumes over the past year it is interesting to note that during the most recent quarter (September 2010) actual volume declines (-0.77%) were softer than the econometric models projections (-2.41%).

Table 2.2

Other Small Letters September Quarter 2010 % Growth on previous Quarter (SA)	
Actual Growth	-0.77%
Forecast Growth (Econometric Alone)	-2.41%
Augmentation:	
Forecast Growth (Econometric plus Actual 'Other' Election Mail)	-1.73%

Inferences based upon one quarter always must be qualified due to a preference for analysing a trend however taken at face value Table 2.2 suggests that actual Other small letter volumes for the September quarter are 1.64% higher than what the historical associations would have predicted via the econometric model alone.

The importance of Australia Post's individual mailer data channels becomes immediately evident when the econometric baseline is augmented with the extra 2.6m Other (Inclusive of Other, Clean, Reply Paid and Local) small letter articles associated with the Federal election.

This volume reduces the forecasted quarterly decline (adjusted for election mailings) to -1.73%.

The remaining gap between the actual decline of -0.77% and the forecasted decline (inclusive of election mail) of -1.73% suggests that this category of mail might be benefiting from a correction in the economic climate.

Because the econometric models have no prior observations to assess how letter volumes respond in the periods subsequent to an economic downturn the GFC becomes an important case study for Australia Post for future reference.

This is especially relevant for the Other small letter volume category where no prior association with economic growth has been empirically supported.

Monitoring future periods now becomes crucial to assess any sustained or accelerated trend emanating from the uncertainties of the GFC with the prospect of altering the econometric mix of drivers or possibly including an accelerated dichotomous variable exogenously into the error correction component of the VECM a future possibility.

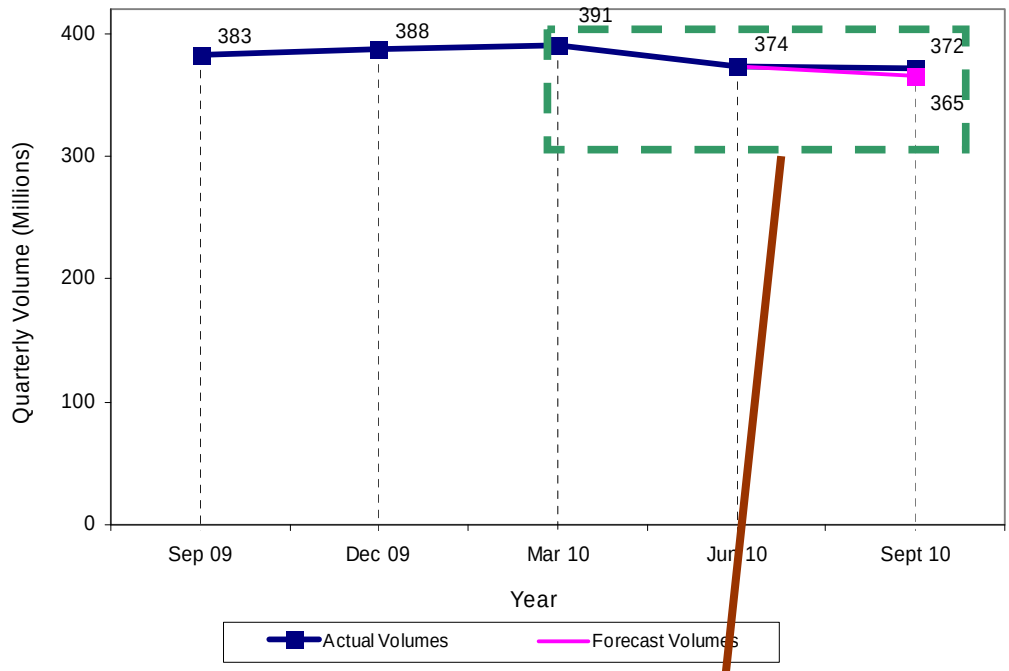
Indeed similar circumstances internationally must also be examined to validate such explanations and to create opportunities for further econometric enhancement or off-model augmentation.

Chart 2.2 illustrates the difference between actual volumes and the econometric forecasts and how this gap closes when augmenting the model forecasts with election related mailings.

Chart 2.2

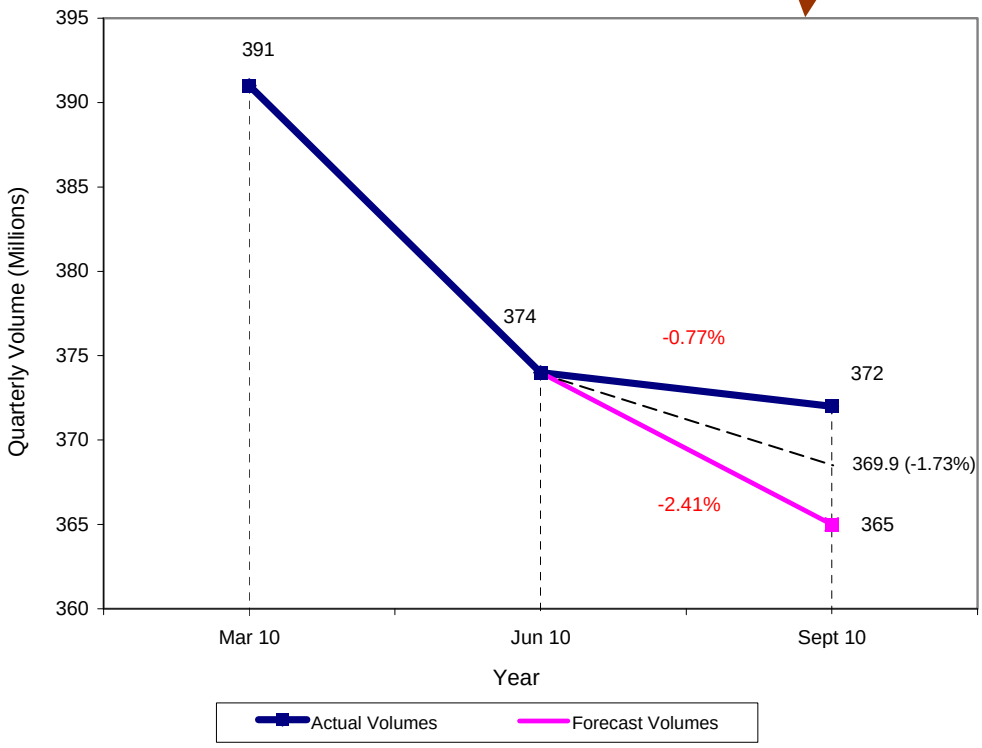
Other Small Letter Volumes (SA)

Historical & Forecast



September 2010 Actual Growth Rate: -0.77%

September 2010 Projected Growth Rate: -2.41%



The dashed line illustrates that augmenting the econometric baseline with an extra 2.55m Other articles emanating from the Federal election reduces the forecasted quarterly decline from -2.41% to -1.73%.

3.0 PRESORT BARCODED SMALL LETTERS

3.1.1 Background

Over the past twelve months PreSort Barcoded small letter volumes have been declining at -2.72% which differs greatly from an annual average growth rate of 1.47% evident since 2000/01 as highlighted in Table 3.1.1.

Table 3.1.1

Key Drivers: PreSort Barcoded Small Letter Volume Model		
Variables	**Rolling 12 Month Growth Rate**	**Average Annual Growth Rate (2000/01 - 2009/10)**
PreSort Barcoded Small Letter Volumes	-2.72%	1.47%
Australian Non-Farm GDP	2.67%	3.20%
S&P/ASX 200 Consumer Discretionary Index	4.74%	-5.44%

3.1.2 Recent Trends

The econometric forecasts for PreSort Barcoded small letter volumes are premised upon:

- A strong association with the domestic economy by virtue of bill presentment transactional type mail; &
- An association with the general health of the advertising industry via direct mail.

The GFC has resulted in levels of economic activity lower than that witnessed over the best part of the last decade and this has driven down growth in bill presentment type mail.[19]

The extent to which the GFC has represented a single downwards shift in demand (structural break) as against acting as a catalyst for accelerated movements towards substitution, consolidation and rationalisation practices by mailers remains a question that can only be tested in light of further data observations and will continue to be monitored in future updates/validations.

[19] Research by Diversified Specifics suggests the possibility of a more income elastic response at lower rates of economic growths as compared to higher rates. For more information consult: Diversified Specifics (May 2009), 'The Impact of Economic Downturns on Income Elastiticity of Demand – PreSort Barcoded Small Letters', Public Version.

3.1.3 Demand Driver Forecast Accuracy – PreSort Barcoded Small Letters

The advertising industry health measure is relatively volatile, which widens the bounds on the sampling error intervals in the forecasting process.

Nonetheless, the quarterly forecast decline in the index based on historical movements was -1.36% as evident in Table 3.1.3.[20] The actual quarterly decline in the index for the September quarter 2010 was greater at -3.83%.

Within the long run component of the VECM the health of the advertising industry is positively associated with PreSort Barcoded Small Letter volumes.

Consequently, underestimating the decline in the index implies that the econometric model has overstated the PreSort Barcoded Small Letter volumes forecast.

Similarly, the forecast quarterly growth rate for Australian Non Farm GDP was 0.75% compared to the actual rate of -1.03% (when adjusting GDP for the agriculture, forestry and fishing gross value added components).[21]

As a result, the forecast quarterly growth rate for Australian Non Farm GDP was over-estimated, which resulted in the econometric model overstating the PreSort Barcoded Small Letter volumes forecast.

Table 3.1.3

Period	Advertising Industry Health Measure		Australian Non Farm GDP#	
	Forecast Quarterly Growth Rate	Actual Quarterly Growth Rate	Forecast Quarterly Growth Rate	Actual Quarterly Growth Rate*
Sep 2010	-1.36%	-3.83%	0.75%	-1.03%

*#Australian Non-farm GDP equates to Total GDP less the Agriculture, forestry and fishing Industry gross value added components; *Seasonally Adjusted Value.*

[20] This projected quarterly value for the health of the Australian Advertising Industry is based upon an annual average decline since 2000/01 in the S&P/ASX 200 Consumer Discretionary Index of -5.44%.
[21] The projected quarterly value for economic growth is based upon a projected financial year growth of 3% for 2010/11 as contained within Alan Marshall, 2009/10 Planning Cycle - Economic Outlook, 20 November 2009, Australia Post.

3.2 AUGMENTATION

The importance of augmentation is best illustrated when comparing the actual performance of PreSort Barcoded small letter volumes over the past quarter to the associated forecasts emanating from the econometric model.

Chart 3.2 highlights actual PreSort Barcoded small letter volume growth (5.34%) is much greater than that predicted by the econometric model (1.77%).

Grasping the importance of augmentation is required to fully understand why actual volumes exceed the econometric volume forecasts.

In this case there is a need to analyse two distinct occurrences that the econometric model does not directly account for (hence the augmentation requirement): an important one off event (the 2010 Federal election) and a set of emerging trends.

(1) The Federal Election

The onset of the federal election during the September quarter had a significant positive impact upon mail. Australia Post identified 32m PreSort Small letters that were generated as a result of the Federal Election.

As a result, the forecast mail volumes should be equivalent to the econometric forecast (509m) plus the PreSort Barcoded Election component (32m), which equates to 541m articles.

This suggests that were the effects of the election applied to the econometric forecasts then this adjusted total (541m) would have overshot actual PreSort Barcoded small letter volumes (530m) by 11m articles.

(2) Emerging Threats

As the econometric forecast is based on historical drivers it “misses” very recent trends towards:

- Consolidation of multiple mail items in the one letter item;
- Rationalisation of billing frequencies; &
- Any movements towards Bill Presentment substitution.

The difference of what the econometric model can forecast inclusive of the one off stimulus provided by the election (541m) and actual volumes (530m) equates to 11m. This is the X factor for the quarter of September that Australia Post need to research, so that econometric forecast can be augmented.

Importantly, it is these emerging threats that represent the single most threat to future PreSort Barcoded small letter volumes in the coming years.

Indeed, it is anticipated that this X-factor is likely to increase in coming years as alternative platforms emerge and mailers seek to further rationalise their cost bases.

Conceptually, Chart 3.2 illustrates how the gap between actual and forecasted PreSort Barcoded small letter volumes is transformed via the inclusion of election mail and how the emerging threats (as represented via the X-factor) might already be acting to suppress actual volumes in this segment outside the predictive scope of the econometric models.

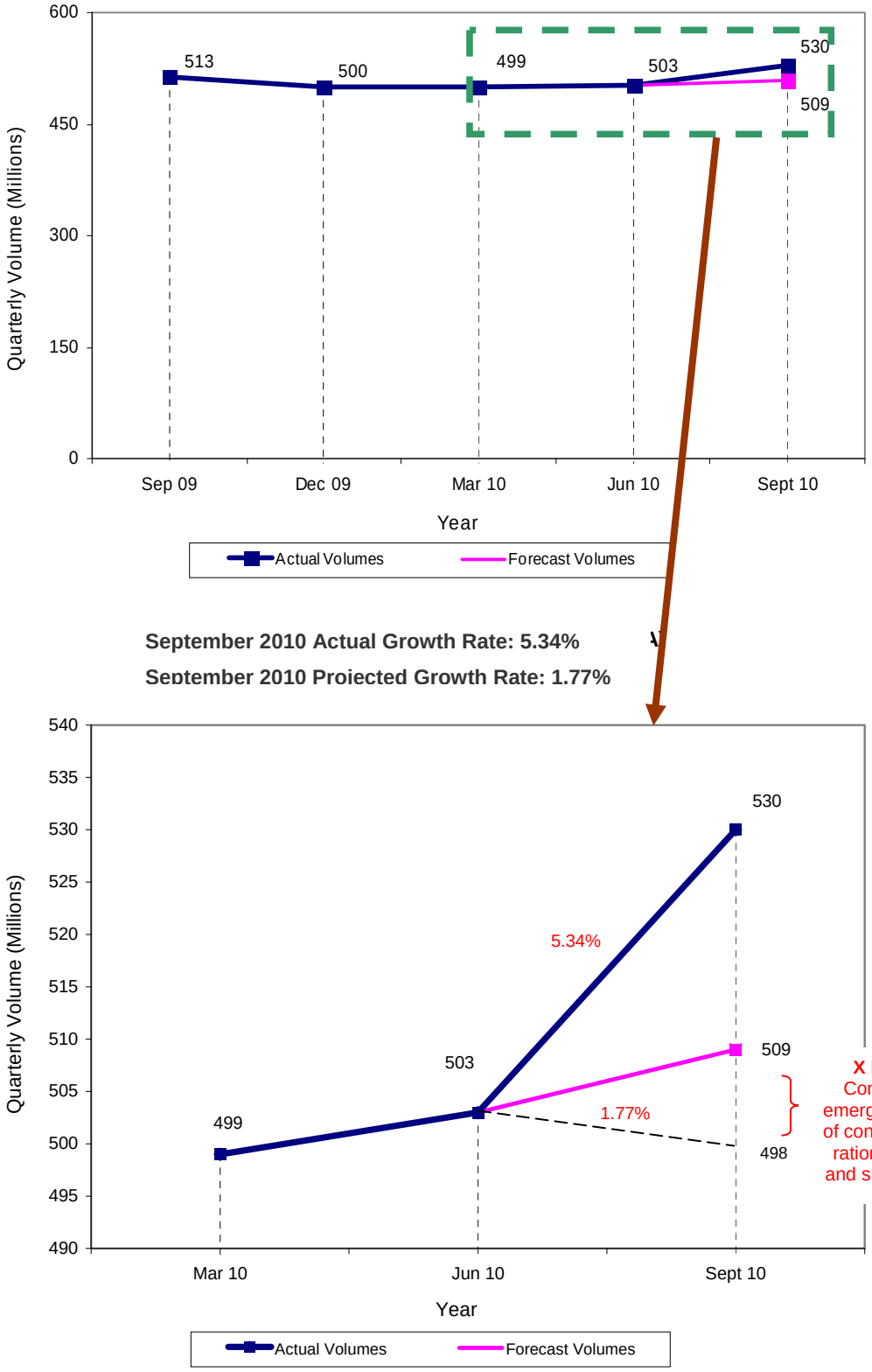
The augmentation undertaken is intended as an indicative illustrative example only as ideally further data on the exact volumes of Federal election mail prior to the 2010 election would have permitted a more robust augmentation.[22]

[22] Federal election mail whilst tested within the econometric framework were resolved to be statistically insignificant. A dichotomous variable approach was employed in the test procedure however certainly Australia Posts ability to now measure election related mail will assist in future augmentation efforts. For further discussion on this matter please consult Section 1.2.3 of this document.

Chart 3.2

PreSort Barcoded Small Letter Volumes (SA)

Historical & Forecast



The dashed line illustrates actual volumes (530m) minus the extra PreSort Barcoded small letter articles emanating from the Federal election (32m) which indicates the econometric baseline does not account for the emerging threats of consolidation, rationalisation and substitution.

4.0 OTHER LARGE LETTERS

4.1.1 Background

Over the past year Other large letter volumes have been declining at -8.53% which is substantially greater than the annual average decline of -0.88% per annum since 2000/01.

Other large letter volumes have traditionally been the most difficult product stream to model in a characteristics based econometric framework due to the difficulties in isolating the main objective of mailers in this segment.

Intuitively substitutive pressures away from large letters were heightened in the mid to late 1990s when there was a large transition from utilising the traditional mail item towards the transmission of electronic documents via email and the increasing prevalence of online forms that would have otherwise been sent via post.

Table 4.1.1

Key Drivers: Other Large Letter Volume Model		
Variables	Rolling 12 Month Growth Rate	Average Annual Growth Rate (2000/01 - 2009/10)
Other Large Letter Volumes	-8.53%	-0.88%
Australian Non-Farm GDP	2.67%	3.20%

4.1.2 Recent Trends

In its entirety Other large letter volumes have shown a statistically strong association with the level of economic activity and clearly the effects of the GFC have impacted substantially here in recent times.

Interestingly, although Other large letter volumes represents the most difficult product stream to attribute a set of distinguishable drivers to the econometric model forecasts (-2.02%) for this category were very similar to the actual decline (-2.37%) in the most recent quarter.

4.1.3 Demand Driver Forecast Accuracy – Other Large Letters

Other Large Letter volumes have in the main, been positively associated with Australian Non Farm GDP.

As noted previously, the forecast quarterly growth rate for Australian Non Farm GDP was 0.75% compared to the actual rate of -1.03%.

The forecast quarterly growth rate for Australian Non Farm GDP was over-estimated, forecast quarterly growth of 0.75% compared to the actual quarterly growth of -1.03%. The positive association with Other Large Letter volumes implies that the econometric model overstated the Other Large Letter volumes forecast.

Table 4.1.3

Period	Australian Non Farm GDP#	
	Forecast Quarterly Growth Rate	Actual Quarterly Growth Rate*
Sep 2010	0.75%	-1.03%

**Seasonally Adjusted Value*

#Australian Non-farm GDP is derived by taking total GDP less Agriculture, forestry and fishing Industry Gross Value Added

4.2. AUGMENTATION

Without a distinguishable deviation between the actual and forecasted Other large letter volumes at this time it is difficult to isolate where there is scope to enhance the augmentation process for this product stream.

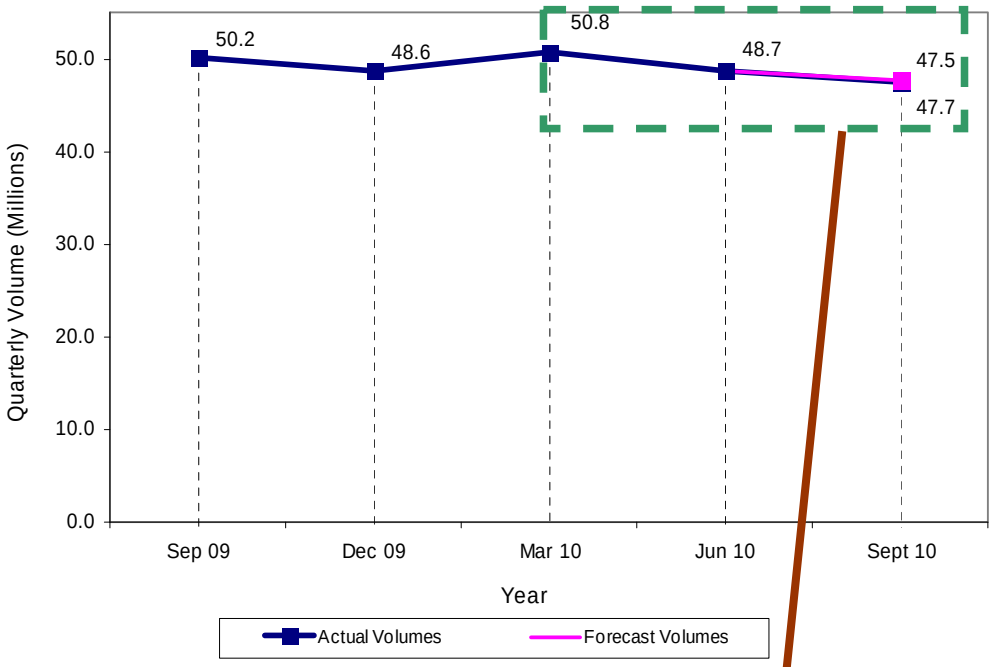
The Other large letter volume category will continue to be monitored and assessed in future letter volume demand updates and validations.

Chart 4.2 illustrates the similarities between actual Other large letter volumes and the econometric volume forecasts for the September quarter of 2010.

Chart 4.2

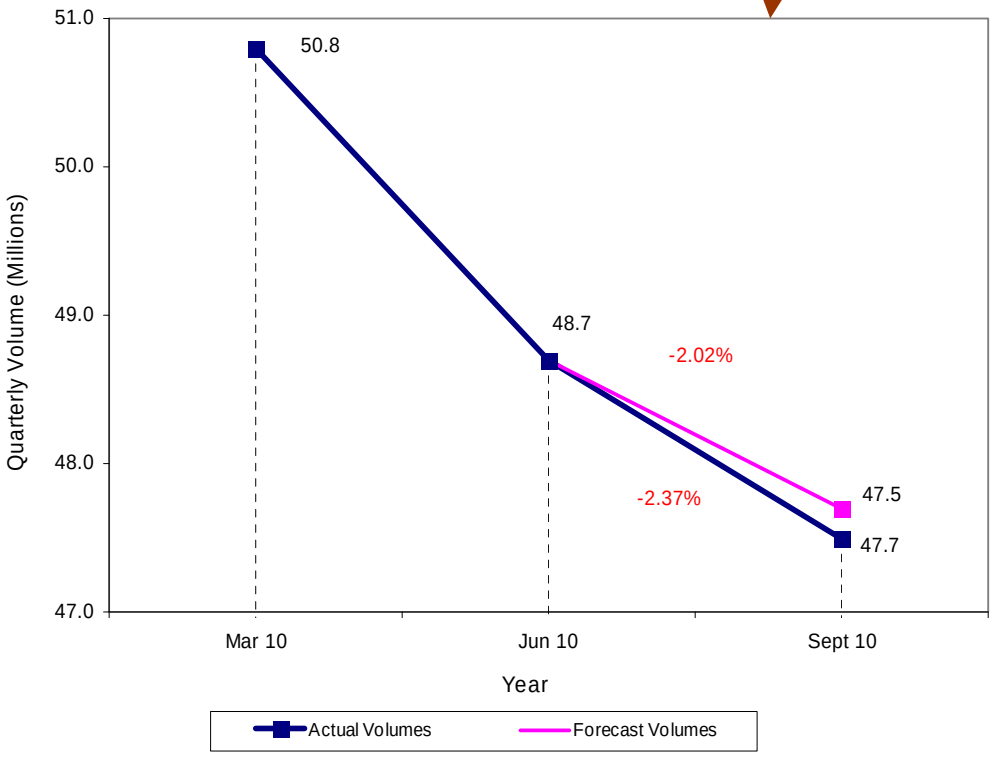
Other Large Letter Volumes (SA)

Historical & Forecast



September 2010 Actual Growth Rate: -2.37%

September 2010 Projected Growth Rate: -2.02%



5.0 PRESORT BARCODED LARGE LETTERS

5.1.1 Background

Over the past year PreSort Barcoded large letter volumes have been declining at -4.88% which is significantly greater than an annual average decline of -0.38% evident since 2000/01.

Key Drivers: PreSort Barcoded Large Letter Volume Model		
Variables	Rolling 12 Month Growth Rate	Average Annual Growth Rate (2000/01 - 2009/10)
PreSort Barcoded Large Letter Volumes	-4.88%	-0.38%
Australian Non-Farm GDP	2.67%	3.20%
S&P/ASX 200 Consumer Discretionary Index	4.74%	-5.44%

5.1.2 Recent Trends

The econometric forecasts for PreSort Barcoded large letter volumes are premised upon:

- A strong association with the domestic economy as a direct result of bulk B2B & B2C mailings; &
- An association with the general health of the advertising industry via non-standard size promotional mailings.

As with its small letter counterpart the GFC has impacted activity (and hence mailings) in the business sector and this has had an adverse effect on PreSort Barcoded large letter volumes.

5.1.3 Demand Driver Forecast Accuracy – PreSort Barcoded Large Letters

The PreSort Barcoded Large Letter econometric model is comprised of an identical set of drivers as its small letter model equivalent. As such, the demand driver forecast assessment is replicated below.

The health of the advertising industry is positively associated with PreSort Barcoded Large Letter volumes. Consequently, underestimating the decline in the index implies that the econometric model has overstated the PreSort Barcoded Large Letter volumes forecast.

Similarly, the forecast quarterly growth rate for Australian Non Farm GDP was 0.75% compared to the actual rate of -1.03%. The forecast quarterly growth rate for Australian Non Farm GDP was over-estimated, which consequently resulted in the econometric model overstating the PreSort Barcoded Large Letter volumes forecast.

Period	Advertising Industry Health Measure		Australian Non Farm GDP#	
	Forecast Quarterly Growth Rate	Actual Quarterly Growth Rate	Forecast Quarterly Growth Rate	Actual Quarterly Growth Rate*
Sep 2010	-1.36%	-3.83%	0.75%	-1.03%

#Australian Non-farm GDP is derived by taking total GDP less Agriculture, forestry and fishing Industry Gross Value Added;
**Seasonally Adjusted Value*

An important driver of PreSort Barcoded large letter volumes that sits outside the econometric set of drivers is the annual report effect.

Changes in the Corporations Legislation Amendment (Simpler Regulatory System) Act 2007 suggest the volume of company annual reports mailed directly to eligible members are likely to decline as a consequence.

This is an area of augmentation that can be quantified through Diversified Specifics seasonality analysis (undertaken by Diversified Specifics as a component of the wider econometric seasonal readjustment process).

Most interestingly however is the fact that the actual values have rebounded significantly (18.54% growth) above what the econometric forecasts predicted (10.54% growth) in the September quarter.

Chart 5.2 illustrates the high growth rates associated with actual PreSort large letter volumes and the econometric volume forecasts for the September quarter of 2010.

Diversified Specifics require additional information from Australia Post to assist in determining where this unexpected increase has emanated from as an increase of such a magnitude warrants investigation.

As a possible hypothesis, recent large floats or Initial Public Offers may have influenced the result, For example, the recent QR National[23] share market listing represented the second largest float (behind Telstra in 1997) in Australian history, potentially a substantial number of prospectus mailings were associated with this event and it may have impacted upon the PreSort Barcoded large letter volume category.

The econometric forecasts themselves exceeded 10% for this volume category, whether this under or overestimated the actual volumes requires further detailed analysis, however, it is an example of a market event that would impact letter volumes but is not explicitly captured within econometric forecasts.

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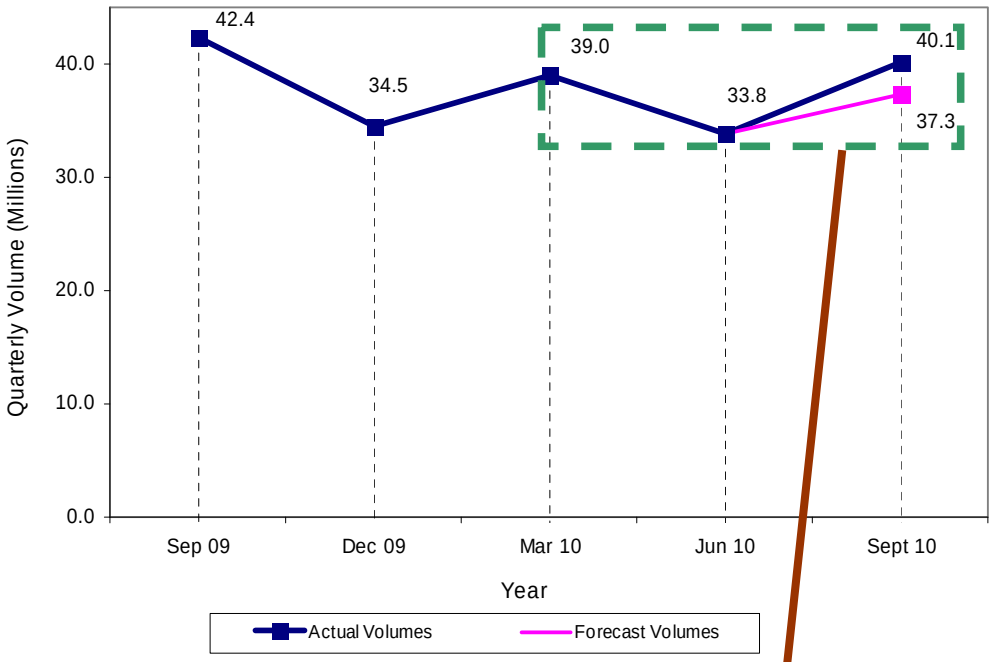
[23] QR National is the largest rail freight haulage business in Australia by tonnes hauled transporting 260 million tonnes of coal and freight a year. It is the largest transporter of coal in Australia and the world's largest rail transporter of coal from mine to port for export markets. See http://www.qrnational.com.au

Chart 5.2

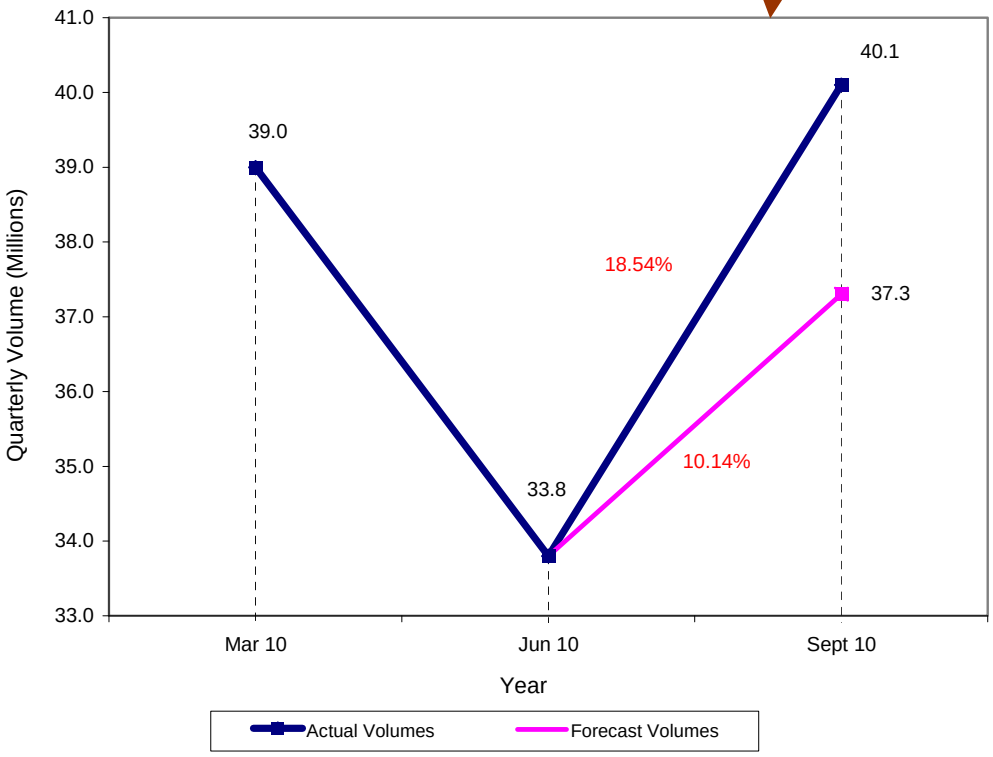
PreSort Barcoded Large Letter Volumes (SA)

Historical & Forecast



September 2010 Actual Growth Rate: 18.54%

September 2010 Projected Growth Rate: 10.14%



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APPENDIX A

A.1 Other Small Letter Volumes

A. Credit Card Model

The preferred long-run cointegrating equation as generated via the research methodology is as follows:

Vector Error Correction Estimates
Date: 12/13/10 Time: 14:46
Sample: 1999Q4 2010Q3
Included observations: 44
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1		
LNSADJOT(-1)	1.000000		
LNSADJCR(-1)	0.753278 (0.06127) [12.2943]		
LNREALPR(-1)	0.674827 (0.09418) [7.16552]		
C	-12.48938		
Error Correction:	**D(LNSADJOT)**	**D(LNSADJCR)**	**D(LNREALPR)**
CointEq1	-0.750553 (0.15193) [-4.94025]	0.064351 (0.06060) [1.06182]	-0.271361 (0.19681) [-1.37877]
D(LNSADJOT(-1))	-0.115162 (0.14225) [-0.80957]	0.045828 (0.05674) [0.80761]	0.071714 (0.18428) [0.38916]
D(LNSADJOT(-2))	-0.065550 (0.12263) [-0.53453]	-0.020091 (0.04892) [-0.41071]	0.059068 (0.15886) [0.37182]
D(LNSADJCR(-1))	0.694350 (0.47476) [1.46254]	-0.072072 (0.18938) [-0.38056]	0.038207 (0.61503) [0.06212]
D(LNSADJCR(-2))	1.180395 (0.41233) [2.86276]	-0.021941 (0.16448) [-0.13340]	-1.074794 (0.53415) [-2.01214]
D(LNREALPR(-1))	-0.145430 (0.15638) [-0.92996]	-0.009410 (0.06238) [-0.15084]	-0.028679 (0.20259) [-0.14156]
D(LNREALPR(-2))	0.095893 (0.15756) [0.60862]	0.032105 (0.06285) [0.51081]	-0.116864 (0.20411) [-0.57256]
C	-0.079359 (0.01695)	0.021109 (0.00676)	-0.026884 (0.02196)

	[-4.68093]	[3.12125]	[-1.22408]
CLOSOFTH	0.073831	-0.009205	0.051509
	(0.01791)	(0.00714)	(0.02320)
	[4.12304]	[-1.28859]	[2.22042]
ECONDOWN	-0.036970	-0.005117	-0.013454
	(0.01231)	(0.00491)	(0.01595)
	[-3.00333]	[-1.04197]	[-0.84370]
R-squared	0.638987	0.229756	0.253617
Adj. R-squared	0.543425	0.025868	0.056045
Sum sq. resids	0.019364	0.003081	0.032497
S.E. equation	0.023865	0.009520	0.030916
F-statistic	6.686611	1.126873	1.283668
Log likelihood	107.5941	148.0311	96.20408
Akaike AIC	-4.436097	-6.274139	-3.918367
Schwarz SC	-4.030599	-5.868641	-3.512870
Mean dependent	-0.006265	0.011864	-0.003574
S.D. dependent	0.035319	0.009646	0.031821

Determinant resid covariance (dof adj.)	3.48E-11
Determinant resid covariance	1.60E-11
Log likelihood	359.5369
Akaike information criterion	-14.84259
Schwarz criterion	-13.50444

B. Cheque Model:

The preferred long-run cointegrating equation as generated via the research methodology is as follows:

Vector Error Correction Estimates
Date: 12/13/10 Time: 14:53
Sample: 2002Q4 2010Q3
Included observations: 32
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1		
LNSADJOT(-1)	1.000000		
LNSADJCH(-1)	-0.495264 (0.01718) [-28.8258]		
LNREALPR(-1)	0.309671 (0.08915) [3.47359]		
C	-0.035662		
Error Correction:	**D(LNSADJOT)**	**D(LNSADJCH)**	**D(LNREALPR)**
CointEq1	-1.189220 (0.29036) [-4.09573]	-0.813414 (0.32020) [-2.54036]	0.280170 (0.44431) [0.63057]
D(LNSADJOT(-1))	0.181851 (0.16369) [1.11092]	0.266420 (0.18052) [1.47587]	-0.220938 (0.25049) [-0.88203]
D(LNSADJOT(-2))	-0.063885 (0.12863) [-0.49665]	0.071284 (0.14185) [0.50252]	0.283591 (0.19684) [1.44075]
D(LNSADJCH(-1))	-0.563414 (0.22357) [-2.52006]	-0.599057 (0.24655) [-2.42977]	0.157512 (0.34212) [0.46041]
D(LNSADJCH(-2))	-0.218821 (0.21088) [-1.03764]	-0.502386 (0.23256) [-2.16028]	-0.159611 (0.32270) [-0.49462]
D(LNREALPR(-1))	-0.181653 (0.16272) [-1.11638]	0.144176 (0.17944) [0.80348]	-0.099188 (0.24899) [-0.39836]
D(LNREALPR(-2))	-0.085124 (0.15175) [-0.56096]	0.024151 (0.16734) [0.14432]	0.025609 (0.23221) [0.11029]
C	-0.028808 (0.00785) [-3.66941]	-0.044634 (0.00866) [-5.15533]	0.002001 (0.01201) [0.16653]
R-squared	0.632442	0.310663	0.223978
Adj. R-squared	0.525238	0.109606	-0.002361
Sum sq. resids	0.007691	0.009353	0.018010

S.E. equation	0.017902	0.019741	0.027394
F-statistic	5.899403	1.545150	0.989568
Log likelihood	87.92852	84.79803	74.31523
Akaike AIC	-4.995532	-4.799877	-4.144702
Schwarz SC	-4.629098	-4.433443	-3.778268
Mean dependent	-0.012134	-0.022705	0.001985
S.D. dependent	0.025981	0.020921	0.027361

Determinant resid covariance (dof adj.)	8.49E-11
Determinant resid covariance	3.58E-11
Log likelihood	248.6177
Akaike information criterion	-13.85111
Schwarz criterion	-12.61439

A.2 PreSort Barcoded Small Letter Volumes

The preferred long-run cointegrating equation as generated via the research methodology is as follows:

Vector Error Correction Estimates
Date: 12/13/10 Time: 16:01
Sample: 1996Q1 2010Q3
Included observations: 59
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1		
LNSADJPR(-1)	1.000000		
LNSADJNO(-1)	-0.857359 (0.10160) [-8.43820]		
LNSP200C(-1)	-0.171427 (0.03926) [-4.36664]		
C	7.123811		
Error Correction:	**D(LNSADJPR)**	**D(LNSADJNO)**	**D(LNSP200C)**
CointEq1	-0.517886 (0.13454) [-3.84934]	-0.005399 (0.02912) [-0.18540]	0.275234 (0.35825) [0.76827]
D(LNSADJPR(-1))	-0.154890 (0.12702) [-1.21936]	0.012927 (0.02749) [0.47017]	-0.036338 (0.33824) [-0.10743]
D(LNSADJNO(-1))	0.447660 (0.66648) [0.67168]	-0.231200 (0.14426) [-1.60270]	2.951869 (1.77472) [1.66328]
D(LNSP200C(-1))	-0.054880 (0.05258) [-1.04384]	-0.006769 (0.01138) [-0.59480]	0.254234 (0.14000) [1.81598]
C	-0.012351 (0.01515) [-0.81508]	0.012361 (0.00328) [3.76864]	0.018433 (0.04035) [0.45682]
BARCINTR	0.028146 (0.01719) [1.63771]	-0.002866 (0.00372) [-0.77033]	-0.053979 (0.04576) [-1.17951]
R-squared	0.368696	0.081025	0.151668
Adj. R-squared	0.309139	-0.005671	0.071637
Sum sq. resids	0.084604	0.003964	0.599893
S.E. equation	0.039954	0.008648	0.106390
F-statistic	6.190648	0.934590	1.895108
Log likelihood	109.4284	199.7233	51.64459
Akaike AIC	-3.506046	-6.566893	-1.547274
Schwarz SC	-3.294771	-6.355618	-1.335999
Mean dependent	0.010771	0.008320	0.004435
S.D. dependent	0.048069	0.008623	0.110418

Determinant resid covariance (dof adj.)	1.14E-09
Determinant resid covariance	8.25E-10
Log likelihood	365.8692
Akaike information criterion	-11.69048
Schwarz criterion	-10.95102

A.3 Other Large Letter Volumes

The preferred long-run cointegrating equation as generated via the research methodology is as follows:

Vector Error Correction Estimates
Date: 12/13/10 Time: 16:09
Sample: 2001Q3 2010Q3
Included observations: 37
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1	
LNSADJ_A(-1)	1.000000	
LNSADJNO(-1)	-0.123106 (0.17687) [-0.69604]	
C	-2.467689	
Error Correction:	**D(LNSADJ_A)**	**D(LNSADJNO)**
CointEq1	-0.596775 (0.15920) [-3.74848]	-0.033957 (0.03244) [-1.04687]
D(LNSADJ_A(-1))	-0.055603 (0.16716) [-0.33264]	0.063424 (0.03406) [1.86228]
D(LNSADJ_A(-2))	-0.062459 (0.15651) [-0.39908]	-0.018253 (0.03189) [-0.57244]
D(LNSADJNO(-1))	-0.759775 (0.77618) [-0.97887]	-0.275613 (0.15814) [-1.74284]
D(LNSADJNO(-2))	-0.821457 (0.76242) [-1.07743]	-0.515247 (0.15534) [-3.31693]
C	-0.028856 (0.02167) [-1.33178]	0.019989 (0.00441) [4.52806]
CLOSOFTH	0.066498 (0.02151) [3.09142]	-0.004114 (0.00438) [-0.93881]
ECONDOWN	-0.097374 (0.01962) [-4.96216]	-0.009442 (0.00400) [-2.36154]
R-squared	0.514331	0.464567
Adj. R-squared	0.397100	0.335325
Sum sq. resids	0.033011	0.001370
S.E. equation	0.033739	0.006874
F-statistic	4.387343	3.594543
Log likelihood	77.40328	136.2665
Akaike AIC	-3.751528	-6.933325

Schwarz SC	-3.403222	-6.585018
Mean dependent	-0.002792	0.007856
S.D. dependent	0.043452	0.008432
Determinant resid covariance (dof adj.)		5.34E-08
Determinant resid covariance		3.28E-08
Log likelihood		213.8077
Akaike information criterion		-10.58420
Schwarz criterion		-9.800510

A.4 PreSort Barcoded Large Letter Volumes

The preferred long-run cointegrating equation as generated via the research methodology is as follows:

Vector Error Correction Estimates
Date: 12/13/10 Time: 16:15
Sample: 1996Q3 2010Q3
Included observations: 57
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1		
LNSADJ_B(-1)	1.000000		
LNSADJNO(-1)	-0.842068 (0.11175) [-7.53526]		
LNSP200C(-1)	-0.424297 (0.04850) [-8.74844]		
C	13.15721		
Error Correction:	**D(LNSADJ_B)**	**D(LNSADJNO)**	**D(LNSP200C)**
CointEq1	-1.046631 (0.20120) [-5.20204]	0.004760 (0.01908) [0.24949]	0.423779 (0.24489) [1.73050]
D(LNSADJ_B(-1))	0.012149 (0.17329) [0.07010]	0.000398 (0.01643) [0.02423]	0.028854 (0.21093) [0.13679]
D(LNSADJ_B(-2))	0.294776 (0.15025) [1.96193]	0.004963 (0.01425) [0.34830]	-0.017798 (0.18288) [-0.09732]
D(LNSADJ_B(-3))	0.135491 (0.11678) [1.16025]	0.027763 (0.01107) [2.50695]	-0.044209 (0.14214) [-0.31103]
D(LNSADJNO(-1))	0.713787 (1.52380) [0.46842]	-0.216658 (0.14451) [-1.49930]	1.877278 (1.85471) [1.01217]
D(LNSADJNO(-2))	-0.831690 (1.57229) [-0.52897]	-0.403674 (0.14910) [-2.70733]	-1.622204 (1.91373) [-0.84767]
D(LNSADJNO(-3))	-4.022437 (1.55703) [-2.58341]	-0.231948 (0.14766) [-1.57086]	-4.846611 (1.89515) [-2.55738]
D(LNSP200C(-1))	-0.158539 (0.12511) [-1.26717]	0.002570 (0.01186) [0.21665]	0.348566 (0.15228) [2.28894]
D(LNSP200C(-2))	-0.021744 (0.13287) [-0.16364]	0.014446 (0.01260) [1.14646]	0.282846 (0.16173) [1.74889]

D(LNSP200C(-3))	-0.289480	-0.002724	0.069870
	(0.12262)	(0.01163)	(0.14925)
	[-2.36082]	[-0.23426]	[0.46815]
C	-0.011758	0.018901	0.110903
	(0.04627)	(0.00439)	(0.05632)
	[-0.25408]	[4.30714]	[1.96902]
BARCINTR	0.074619	-0.004987	-0.092757
	(0.03695)	(0.00350)	(0.04497)
	[2.01957]	[-1.42338]	[-2.06257]
R-squared	0.724693	0.374739	0.372907
Adj. R-squared	0.657396	0.221898	0.219617
Sum sq. resids	0.297438	0.002675	0.440647
S.E. equation	0.081300	0.007710	0.098955
F-statistic	10.76854	2.451816	2.432695
Log likelihood	68.90516	203.1770	57.70356
Akaike AIC	-1.996672	-6.707965	-1.603634
Schwarz SC	-1.566556	-6.277849	-1.173518
Mean dependent	0.014516	0.008337	0.003875
S.D. dependent	0.138898	0.008740	0.112017

Determinant resid covariance (dof adj.)	3.57E-09
Determinant resid covariance	1.76E-09
Log likelihood	331.8890
Akaike information criterion	-10.27681
Schwarz criterion	-8.878931