Australia Post
Domestic Letter Volume Demand Update

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Prepared for:

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Note

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Disclaimer

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KEY FINDINGS

Diversified Specifics most recent econometric volume forecasts of Australia Posts core letter segments are derived from a greater focus on the changing postal industry landscape evident since the 2007/08 global financial crisis.

Over that period all key letter volume categories have registered increasingly severe declines when contrasted to the volume changes that occurred throughout the 2000/01 to 2007/08 period (highlighted by Table KF.1).

Table KF.1 Historical Percentage Change in Key Domestic Letter Volume Segments

Australia Post Letter Volume Segment	% Change 2013 Q3 to 2014 Q3	Average Annual % Change	
		2000/01 to 2007/08	2007/08 to 2012/13
Other (Ordinary) Small	-7.32%	-1.70%	-6.97%
PreSort Small	-6.15%	2.73%	-3.36%
Other (Ordinary) Large	-6.68%	1.04%	-6.52%
PreSort Large	-1.84%	2.25%	-5.64%

The emerging threats of substitution, consolidation and rationalisation have intensified as rapid technological change is resulting in a constantly expanding number of electronic alternatives to the traditional mail item.

More importantly, senders and recipients are embracing the electronic communication channels at an unprecedented rate given the increasing ubiquity of devices now capable of utilising wireless broadband connectivity.

The econometric letter volume forecasts generated by this research undertaking (contained within Table KF.2) are premised upon a continuation in these recent trends towards electronic substitution with each letter volume segment expected to experience further declines of significant magnitude.

Table KF.2 Letter Volume Econometric Forecasts (Percentage Changes)

	Forecasted Letter Volumes (Millions)				Forecasted Percentage Declines			
	Small		Large		Small		Large	
	Other	PreSort	Other	PreSort	Other	PreSort	Other	PreSort
2014/15*	1018	1656	149	126	-11.7%	-5.5%	-4.8%	-2.4%
2015/16	928	1503	142	121	-8.9%	-9.3%	-4.4%	-3.9%
2016/17	768	1378	112	110	-17.2%	-8.3%	-21.2%	-9.3%

For greater detail on the underpinnings of these forecasts the reader is advised to consult the source documentation.

Direct interpretation of the forecasts contained within Table KF.2 is cautioned by the econometric methodology employed which involves projecting historical trends forward.

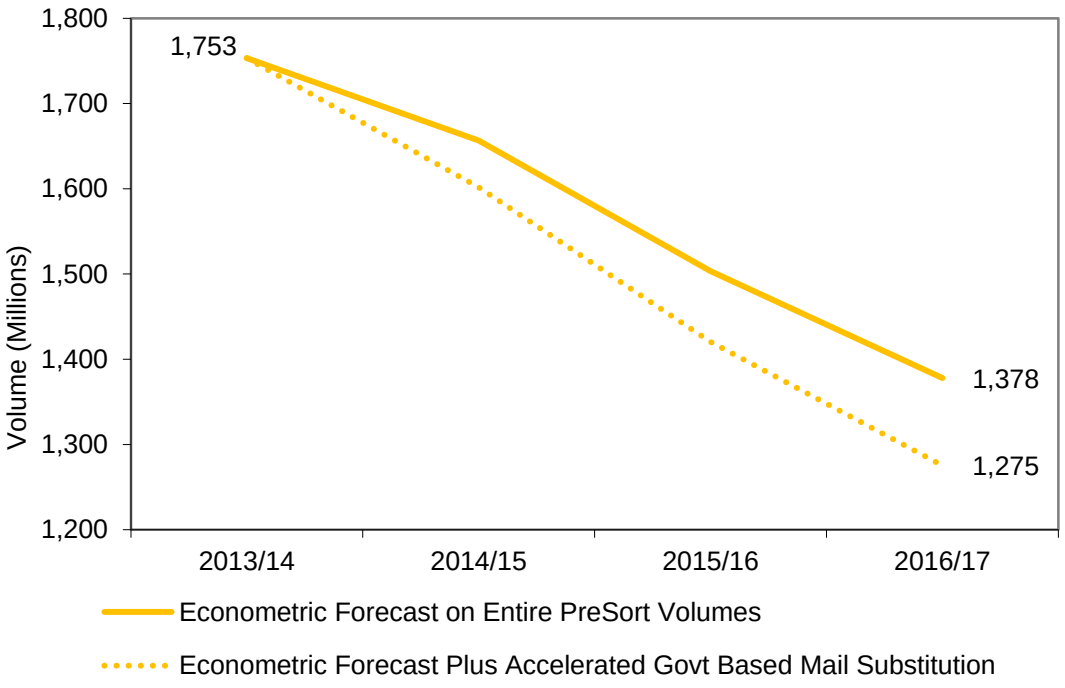
Evidence also suggests a new wave of threats is presently emerging, likely to impact letter volumes to a greater degree than any empirical study alone may predict. It is therefore crucial to overlay any additional intelligence onto the econometric projections to generate a more realistic outcome.

An important example of this next wave of electronic substitution away from the traditional letter litem is given by initiatives relating to e-Government which suggest virtually all government services and public interactions will be available digitally by 2017 on an opt-in basis.

As at 2013/14 16% of total PreSort small letter volumes emanate from this group of senders, equating to 281.2 million letter volumes.

Assuming this results in a 25% per annum decline in volumes within this category then total PreSort small letter volumes are likely to register declines well in excess of those estimated by the econometric modelling alone, illustrated in Chart KF.1.

Chart KF.1 Potential impact of a 25%p.a. digitisation of government PreSort small letter volumes



Whilst this scenario is intended for illustrative purposes only it represents a conservative estimate of the eventual total small letter volume substitutive effects that could occur should the existing government portal, or a digital mailbox equivalent, expand its scope into other industries when facilitating the delivery of bill presentments online.

Indeed, given the importance of transactional mail within the letters business in general it is very likely similar effects will extend into Australia Post's Other (Ordinary) letter volume segment and also result in a set of declines more severe than those predicted by the econometric forecasts alone.

1. INTRODUCTION

1.1 OVERVIEW

In late 2014 Australia Post commissioned Diversified Specifics to update the existing set of econometric models that aimed at explaining and forecasting volume movements across each of the key domestic letter segments.[1]

Although Diversified Specifics has conducted econometric modelling of letter volumes at Australia Post for over 15 years, on this occasion the research was motivated by Australia Post's latest price notification to the Australian Competition and Consumer Commission (ACCC).

As distinct from Diversified Specifics 2013 study, this research undertaking models letter volume demand related issues for each segment relevant to Australia Post's core letters business.[2] Such scope is important as noted by the ACCC who in their 2014 decision stated:

> *Although the ACCC's prices surveillance of reserved services is limited to 'ordinary' letter services, such as the assessment of increases in the basic postage rate, the ACCC's PTRM assesses the impact of the pricing proposal on the whole of Australia Post's reserved services, which all use a common infrastructure and processes, and are all affected by certain legal obligations and monopoly privileges.*[3]

This report acts as a summary of the 2015 econometric modelling with the emphasis of the research aimed at largely focusing on the changing landscape of the Australian postal industry since the commencement of the global financial crisis in 2007/08.

Where turning points in the letter volume segments could be detected Diversified Specifics was instructed to identify a set of drivers more relevant to current and future letter volume trends than was the case with previous modelling efforts.[4]

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[1] The forecast horizon applicable to this research undertaking extends across the 2014/15 to 2016/17 financial years.

[2] Diversified Specifics (2013), "Domestic Other Letter Volume Demand Update – November 2013"

[3] Australian Competition and Consumer Commission (2014), Australia Post price notification for its 'ordinary' letter service, February 2014, ACCC Decision, Commonwealth of Australia, p.25

[4] The exception to this pertains to the Other (Ordinary) small letter volume segment where bill payments type substitution away from the letter had tended to occur in a directly measurable manner for a lengthier period of time, hence an investigation into this variable from an earlier point in time was undertaken given the comparatively favourable data availabilities. For greater detail the reader is advised to consult Appendix A of this document.

In recent times the basic postal rate (BPR) of Other (Ordinary) small letter volumes has remained reasonably static yet consistently letter volumes have registered unprecedented year on year declines across this, and indeed a multitude of Australia Post's, letter segments.[5]

This research undertaking therefore sought to isolate, explain and quantify the impact of a number of hypothesised letter volume drivers with a primary focus on the forces of electronic substitution away from the traditional letter item facilitated by the emergence and penetration of numerous alternative communication channels.

These trends have represented a new era of change facing Australia Post's core letters business.

While the pre-2007/08 period suggested a more gradual decline in Other (Ordinary) small letter volume movements in the realm of bill payments type mail it is difficult to now dispute the ubiquitous and aggressive nature of electronic substitution that confronts the core Australia Post letters business.

Despite this there exists no singular measurement of electronic substitution across all categories of letter mail.

Rather, substitution is defined by a variety of electronic communication channels that emerge as a result of technological and behavioural change to impact the various letter volume segments at different times diffusing their effects in a variety of ways.

Technological change alone is not the sole determinant of the amount of substitutive pressure applied to Australia Post's letter segments. The behaviours of both senders and receivers and their willingness to accept alternative modes of correspondence also play a crucial role in determining the success of a particular channel.

Research in this and other studies by Diversified Specifics suggest the critical change over the next four to five year period will revolve around the evolution of digital mailboxes and the digitisation of bill presentment type mail.

Although these impacts directly affect PreSort small letter volumes, a by-product of any behavioural change to transactional communications is that it will necessarily translate into accelerated reductions in Other (Ordinary) small letter volumes on two fronts:

[5] Between June 2010 and March 2014 the BPR remained largely at 60c with some minor movements in imprint/metered rates and despite this letter volumes have continually declined.

1. It will automatically facilitate greater opportunities for electronic bill payments in concert with the enabling of online bill presentments; and

2. It will reduce the portion of the Other (Ordinary) small letter volume segment attributed to bill presentments such as those rendered by small and medium size enterprises (SME's).

Across the forecast horizon it is very likely that the rate of substitution away from the traditional letter item in this category will be well above that of historical levels should online bill presentment portals (such as '*MyGov*' or a digital mailbox equivalent) attain a wider degree of penetration throughout the traditional recipient base.[6]

With this in mind, econometric forecasts such as those derived as a component of this research study that rely heavily on empirical trends must represent only a part of Australia Post's intelligence in attempting to quantify the future magnitude of electronic substitution.

The findings of this report will not only attempt to highlight the very real threat of actual electronic substitution but also stress signals emanating from certain industry groups that are likely to act as lead indicators of behaviours that will eventually result in a significant decline in letters associated with presentment type communications.

This report proceeds in the following manner.

Section 1 contains this introduction and a discussion about the consequences and limitations of forecasting utilising an entirely empirical approach.

A descriptive overview of the trends applicable to Australia Post's small and large letter products is then provided in Section 2 to highlight the recent increase in volume declines.

This is followed in Sections 3 to 6 by a summary of the estimation and forecasting results generated for each of the four primary letter volume classifications.

A series of Appendices then concludes the report to provide a greater insight into the techniques employed and statistical outputs derived as a result of this research undertaking.

[6] *MyGov* is an online presentment portal that has already generated significant registrations and support from the largest Government originating senders including the Department of Human Services, the Department of Health, the Australian Taxation Office, the Department of Veterans' Affairs and the National Disability Insurance Scheme.

1.2 CONSEQUENCES FOR MODELLING & FORECASTING

The ability to incorporate a vast array of emerging threats to letter volumes directly into the modelling framework can, at times be limited by the availability of few, if any empirical observations.

Nevertheless over time as additional information on emerging threats becomes available this provides increasing clarity on the penetration levels of the various platforms and makes it possible to indirectly measure the scope, magnitude and direction of technological change.

Where localised information and data is unavailable international case studies, company announcements, governmental press releases and Australia Posts own industry based letter volume data may provide valuable insights into these emerging technologies.

Such auxiliary information then becomes useful in developing scenarios for Australian letter volume substitution until a sufficient set of tractable observations are ultimately generated.

The forecasts for PreSort small letter volumes are therefore enhanced by a simplified scenario that is employed to augment the econometric projections.

This scenario is presented in Section 4.4.1 of this document to illustrate the possible take-up of wider bill presentment type substitution at industry level as a consequence of the anticipated growth in online communications portals within the Public Administration and Security Industry.

In this manner the Diversified Specifics methodology that involves the construction of baseline forecasts generated via a set of econometric models is then augmented with further intelligence on emerging threats that may not have the requisite empirical information required to embed them within the formal statistical process. [7]

The establishment of a baseline in a structured scientific manner in addition to keeping abreast of emerging threats to letter volumes is crucial for internal policy formulation.

Similar caveats to previous demand updates on the baseline forecasts do apply and any interpretations of the econometric projections presented in this documentation should be treated with all due care with a recognition that further augmentations based upon sound institutional knowledge must continually be cultivated.[8]

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[7] The vector error correction models developed in this study nest the structural and cyclical components of letter volume trends into a methodology that allows an examination of short and long run fluctuations of letter volumes and their relevant drivers.

[8] Caveats on the econometric forecasts derived within this research undertaking may be found in Appendix D of this report.

2. RECENT TRENDS

2.1 SEGMENTED LETTER VOLUME GROWTH

The term '*technology wedge*' highlights the observed difference between growth in letter volumes and movements in the Gross Domestic Product (GDP) of an economy.

More precisely, as the choices of how communications might be delivered changes so too does the business processes that generate them. These processes alter for a variety of reasons, primarily driven by the efficiency objectives related to the sender.

When considering transactional mail and the volume loss to an electronic alternative, this efficiency is measured by the cost and ability associated with issuing/receipting payment via a singular mechanism or according to a shorter time frame.

For the Other (Ordinary) small letter volume segment the technology wedge became evident many years prior to 2007/08 as bill payments type volumes began to consistently migrate towards alternative mediums including phone and internet banking in addition to an increased popularity of direct debit facilities.

Table 2.1.2 highlights this longer term growth rate divergence between Other (Ordinary) small letter volumes and the level of economic activity yet also emphasises a similar separation in recent times for bill presentment type volumes (largely defining the PreSort small letter volume segment).

Table 2.1.1 Annual Percentage Changes
Small Letter Volumes vs GDP Growth

	Small Letters		Australian Non-farm GDP
	Other (Ordinary)	PreSort	
2003/04	-2.9%	5.2%	3.7%
2004/05	-3.4%	3.8%	3.2%
2005/06	-2.9%	3.0%	3.0%
2006/07	-3.5%	4.2%	4.3%
2007/08	-2.1%	6.2%	3.6%
2008/09	-7.1%	-1.1%	1.4%
2009/10	-5.8%	-4.6%	2.0%
2010/11	-5.7%	-1.8%	2.3%
2011/12	-5.8%	-5.6%	3.8%
2012/13	-10.3%	-3.7%	2.6%
2013/14	-5.8%	-2.6%	2.4%

Indeed, the accelerated declines in Other (Ordinary) small letter volumes since 2007/08 is not surprising given the bill presentment component of this segment also consistently began to register annual declines over that same period.[9]

The global financial crisis of 2007/08 certainly acted as a catalyst for technological and behavioural change on the part of senders and recipients of transactional communications.

By 2011/12 both the PreSort and Other (Ordinary) small letter volume segments failed to respond in line with an increase in the general health of the domestic economy.

Small letter volumes have now entered a new era where the forces of structural and behavioural change have tended to replace any cyclical (or income) explanations of letter volume movements.

This does not imply movements in the level of domestic economic activity have zero impact upon future fluctuations in domestic small letter volumes.

Stagnating Gross Domestic Product (GDP) growth may still act as a further catalyst to increase the propensity that a sender will switch to a more cost effective mode of communication, as was the case during the global financial crisis.

Although the impact of changes in the performance of the domestic economy should continue to be monitored when formulating letter volume forecasts, its formal role within an econometric forecasting framework is certainly reduced when compared to the pre 2007/08 period.

Nevertheless, over the last couple of decades and especially since the 2007/08 global financial crisis the changing behaviours governing the usage of various communication channels has resulted in accelerated volume declines at Australia Post.

These trends are now commonplace throughout most of the developed world as the threats of digital substitution away from the traditional letter item becomes increasingly evident.[10]

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[9] The linkage between trends in bill presentment declines and the SME portion of the Other (Ordinary) small letter volume segment is discussed in further detail within Section 1.1 of this document. These same trends largely account for the post 2007/08 deterioration in PreSort small letter volume growth highlighted in Table 2.1.1.

[10] The declines cannot be entirely attributable to substitutive pressures. An element of the decreasing letter volumes are as a result of consolidation and rationalisation practices that suggest while senders are decreasing their exposure to mail this does not necessarily imply they are substituting away from mail per se. These concepts are reflective of a strong sender-recipient value component that still accords the letter item and has particular relevance to PreSort small letter volumes (discussed further in Chapter 4 of this document).

Table 2.1.2 illustrates the severe declines experienced in each of Australia Posts key letter volume product segments over the past twelve months which are especially stark when contrasted to the average annual growth rates since 2000/01.

Table 2.1.2 Percentage Changes in Key Domestic Letter Segments

Australia Post Letter Segment	Sep 2013 to Sep 2014 % Change	Average Annual % Change	
		2000/01 to 2007/08	2007/08 to 2012/13
Small Letter Volumes			
Other (Ordinary)	-7.3%	-1.7%	-7.0%
PreSort	-6.2%	2.7%	-3.4%
Large Letter Volumes			
Other (Ordinary)	-6.7%	1.0%	-6.5%
PreSort	-1.8%	2.3%	-5.6%

In pinpointing the commencement of the turning points volumes pertaining to each letter segment structural break tests were undertaken and suggested that a common turn point occurred in 2008 in line with the onset of the global economic recession.[11]

At that time firms typically began to struggle to maintain their profit margins via sales as spending within the Australian economy tightened.

In this environment companies became increasingly likely to shift their focus towards a number of structural change effects that were premised upon pursuing cost containment objectives via a number of strategies including:

- **Substitution:** Motivated by attaining the lowest possible transaction cost for communicating their message. A decision to do so involves investigating, developing and cultivating a widespread acceptance of alternative electronic channels to the traditional mail item;

- **Rationalisation:** Reviewing of the frequency of mailing and billing cycles to result in a reduction in the amount of invoices and statements sent according to a given timetable; and

[11] A summary of the statistical decision criteria associated with these structural break tests can be found in Appendix A of this document.

- **Consolidation:** Revising the composition of letter based communications to consolidate differing messages into a single communication. Examples might include:

    1. Integrating billing and statement based communications with existing customer relationship management (CRM) systems so as to consolidate transactional and promotional mailings; &

    2. Providing customers with a single statement or account for multiple activities such as fixed-line and mobile telecommunications; gas and electricity; savings accounts and home loans; etc.

Although these changes largely impacted PreSort small letter volumes since 2007/08, the accelerated declines of the remaining segments implied the impact of technological change combined with the changing behavioural mind set of senders and receivers was more comprehensive than first thought.

Indeed, the accelerated Other (Ordinary) small letter volume decline since 2008/09 also suggests some exposure to additional:

- **Income effects**: As economic conditions dipped below their long run averages and the quantity of transactions within the economy and hence the number of bills to be settled, declined; and

- **Structural change effects:** A percentage of small and medium enterprise (SME) bill presentment type mailings that exist within the Other (Ordinary) small letter volume category were exposed to substitutive pressures in a similar manner to the bulk presentments of the PreSort small letter volume segment.

The post 2007/08 declines were largely a result of the aforementioned cyclical and structural change effects, with the impact of the former pre-dating that of the latter.

Chart 2.1.1 provides an illustration of the changing landscape characterising Australia Posts small letter volume segments since the global financial crisis of 2008.

Accelerated downward trends are also evident post 2007/08 for each of the large letter volume segments as illustrated in Chart 2.1.2.

Moreover, the growth turnaround for the large letter class of mail items has been even more pronounced when contrasted to the small letter equivalents.

In 2006/07 annual growth in the large letter volume segments registered 3.83% compared to a small letter growth rate of 0.45%.

Chart 2.1.1 Small Letter Volumes – Other (Ordinary) vs PreSort

Dashed red line indicates the onset of the Global Financial Crisis

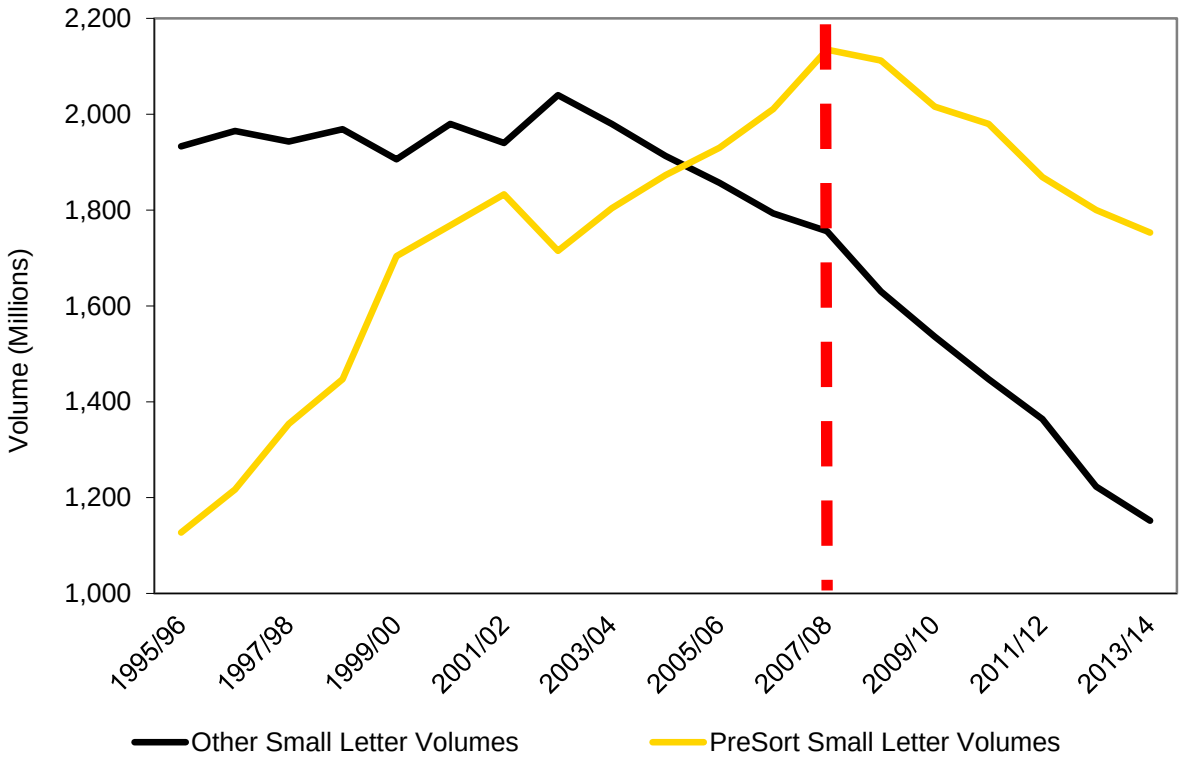
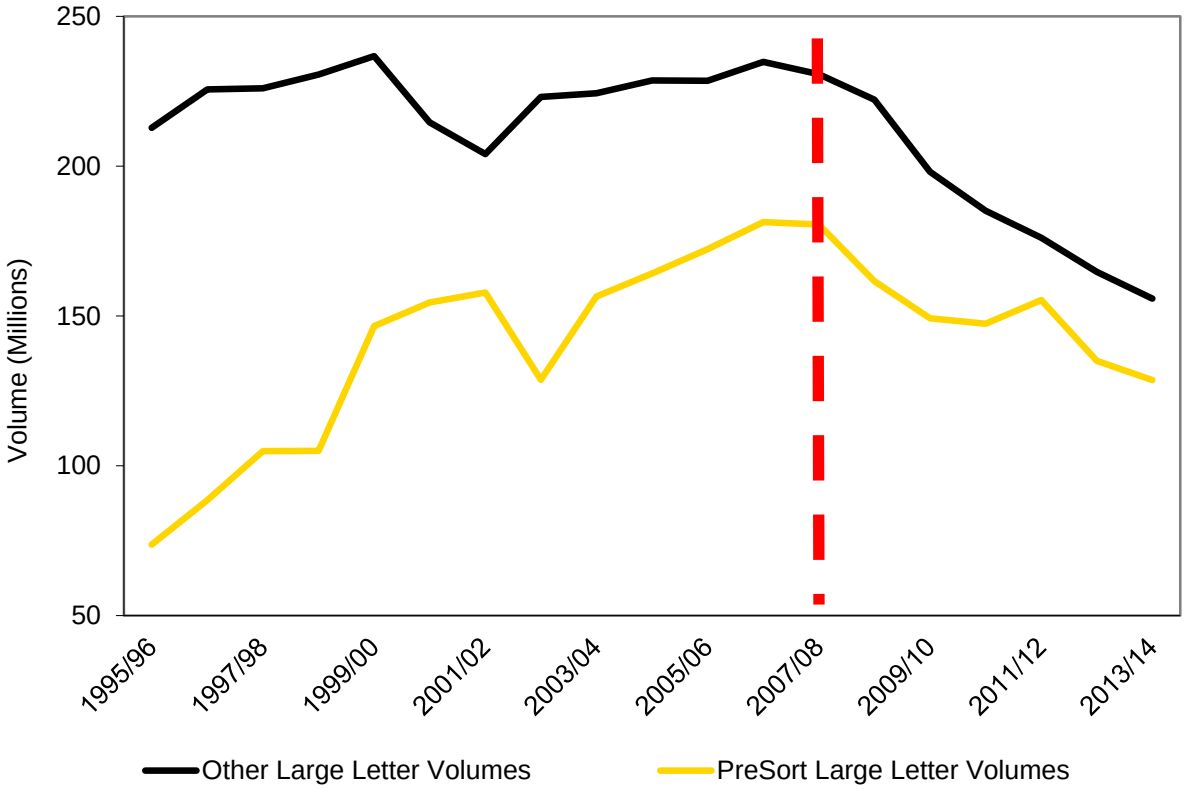


Chart 2.1.2 Large Letter Volumes – Other (Ordinary) vs PreSort

Dashed red line indicates the onset of the Global Financial Crisis



By 2013/14 large letter volume declines had dropped to -5.10% and in comparison the small letter volumes falls were -3.9%.

In addition to the income effects described earlier each of the large letter volume segments were confronted by substitutive pressures that directly impacted volumes from that moment.

The Corporations Legislation Amendment (Simpler Regulatory System) Act of 2007 had a significant negative impact on PreSort large letter volumes.

The Act changed the rules governing the way annual reports could be disseminated by permitting the distribution of annual financial reports to eligible members in a digital format.

Since 2007/08 the increasing popularity of cloud storage facilities and flash drives also provided senders with a greater scope and flexibility of alternatives when dealing with the exchange of larger documents.

This appears to be to the detriment of the Other (Ordinary) large letter volume segment which had already been subjected to the significant substitutive pressures presented by the electronic document transmission alternatives such as email and the widespread usage of online form completion technologies.

2.2 SEASONALITY

The quarterly seasonal factors for each of the letter volume segments over the July 1995 to September 2014 timeframe are summarised in Table 2.2.1.

To give each of these figures practical interpretation, the quarterly seasonal factors can be contrasted to a quarterly average of 100%.

Table 2.2.1 Quarterly Seasonal Factors by Letter Segment

	Other (Ordinary)		PreSort	
	Small	**Large**	**Small**	**Large**
March	90.8%	91.4%	96.1%	85.0%
June	94.9%	97.1%	98.4%	91.0%
September	100.5%	104.9%	104.0%	105.1%
December	113.8%	106.5%	101.7%	119.0%

The seasonal factors highlight regular demand tendencies throughout any given year with the major implications being over the July 1995 to September 2014 timeframe:

- PreSort large letter volumes in the December quarter are typically 19% higher than the quarterly average due to the proliferation of annual report type mail;
- The Christmas related peak is evident as Other (Ordinary) small letter volumes in the December quarter tends to be greater than that of the preceding quarters; &
- Volume traffic across all segments tends to be larger in the September and December quarters of any given year when contrasted to the initial six months of that same year.

The evolutionary path of Australia Posts key letter segment specific seasonal factors since 1995/96 is provided in Appendix A in this report.

Of particular note is Table A.5 which highlights a considerable shift in PreSort large letter volume activity away from the fourth quarter towards the third quarter by the end the sample period.

Given these changes over time, the econometric approach employed in this research undertaking conducts seasonal adjustments based upon the dynamic seasonal factors contained within Appendix A. This ensures the resulting seasonally adjusted variables are not compromised by an outdated set of seasonal factors.

2.3 VARIABLE PROJECTIONS

The ex-ante forecasts generated in this document are based upon reasonable projections on the drivers where available.

Given the letter volume forecasts presented in the following sections of this document are a direct function of values on each of the key drivers it becomes important to assess the degrees of variability in the projections on the primary variables utilised.

It is this volatility in the forward projections on the drivers that can impact upon the ex-ante forecasts and as a result Diversified Specifics have attempted to source projections on a number of key drivers from a selection of recognised institutions.

Importantly volatility needs to be assessed across the various forecasting bodies and also in terms of how each projection has altered over time.

This becomes crucial when conducting sensitivity analysis into specific events such as the global financial crisis of 2008 where projections on macroeconomic variables can tend to fluctuate rapidly.

A range of driver projections are therefore presented in this section to assist in making an informed selection on the projected values to employ when developing the ex-ante forecasts.

In cases whereby reliable projections on the drivers are unavailable observable average annual growth rates are utilised as the basis for segmented letter volume forecasting activities.

2.3.1 Real Price

The real price of the various letter volume segments are broadly determined by a combination of (i) Inflationary pressures; (ii) Australia Post nominal pricing related policies; & (iii) Regulatory/Governmental approval of any proposed nominal price changes where required

The inflationary component of the real price variables constructed is captured by recognized projections on the Consumer Price Index (CPI) and these are presented in Table 2.3.1.

Table 2.3.1 Consumer Price Index Projections

Projecting Institution	14/15	15/16	16/17
The Commonwealth Bank (CPI)[12]	2.3%	3.0%	
Commonwealth Budget (CPI)[13]	2.5%	2.5%	2.5%

The post 2007/08 period is characterised by more regular nominal price increases pertaining to each letter volume segment contrasted to the preceding periods where there tended to be small incremental decreases in real price (afforded by annual CPI increases).

This acts as additional motivation (to the structural break tests conducted) in centring the estimation timeframe for a number of the econometric models on the period following the commencement of the global financial crisis.

International studies have questioned the relevancy of incremental price changes as a driver of letter volume fluctuations in an environment characterised by aggressive rates of electronic substitution.[14]

In this situation the senders are confronted with a choice between a near zero cost option (the electronic channel) and a positive cost option (the letter) essentially rendering the incremental price increases irrelevant in any decision to shift towards the digital option.

That is, the senders are not framing their decisions about mail based upon changes in price but rather because the net difference between the two alternative modes of communication is positive their decision in some cases to persist with the letter must also be driven by non-price factors.

Such factors include convenience, technological availabilities, current and future penetration levels, security and performance and the behaviour of the recipient.

Despite a positive cost differential that might favour the electronic modes of communication, senders also value the retention of a relationship with the recipient via the letter because of its comparatively effective promotional qualities. The letter captures the attention of the recipient and facilitates reach in a manner that some digital alternatives have not yet fully achieved.

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[12] The Commonwealth Bank of Australia Economic Perspective, 19 December 2014, p.14

[13] Commonwealth 2014/15 Mid-Year Economic and Fiscal Outlook, 15 December 2014, p.16

[14] For a discussion See Bozzo, Capogrossi, Eakin, Pickett & Srinivasan (2014), "*Is demand for market dominant products of the U.S. Postal Service becoming more own price elastic?*"; and Cigno, Clendenin & Pearsall(2014) "*Are U.S postal price elasticities changing?*", both taken from The Role Of The Postal And Delivery Sector In A Digital Age, M.A. Crew and Timothy J. J. Brennan (eds), Edward Elgar Publishing.

While there is an element of truth to each of these arguments there is also a fundamental law of economics that states prices cannot continue to increase *ad infinitum* without an eventual volume decline.

The estimation of long run price elasticities is fundamental to this research undertaking and must reflect appropriately the set of choices confronting the sender in the current substitutive environment.

The statistical findings in this study reinforce the substantial impact electronic substitution is imparting with all estimates suggesting letter volumes still remain inelastic to a nominal price change.

2.3.2 Gross Domestic Product

As mentioned earlier within this document, recent studies involving the transactional letter item highlights the existence of a '*technology wedge*' which is premised upon the observed divergence between rates of growth in letter volumes and the level of economic activity.[15]

When contrasted to the 1990's recent technological advances combined with behavioural changes have resulted in a greater propensity that an additional transactional letter item is increasingly likely to be presented and responded to using an electronic platform rather than a paper based channel.

As a consequence the evolution of econometric letter volume models such as those developed in this research undertaking has reflected these changes.

The level of economic activity does still possess economic, if not always statistical significance when engaging in the exercise of letter volume forecasting.

Although the propensity to shift towards an electronic substitute has gained momentum recently significant shifts in the level of economic growth must continue to be assessed. Any sharp decline in the level of economic activity implies by association a reduction in total transactional and promotional related communications of which the letter still remains relevant as a channel.

Table 2.3.2 presents a number of forward projections on Gross Domestic Product of which the official Commonwealth Government forecasts until the conclusion of the 2016/17 financial year have been selected for use in this study.

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[15] Paterson C.J. Martin V. L, Nikali H. & Li Q. (2012), *"Dynamic Letter Volume Models: How Does an Economic Downturn Affect Substitution Propensities?"* in Reforming the Postal Sector in the Face of Electronic Competition, M.A. Crew and P.R. Kleindorfer (eds), Edward Elgar Publishing Ltd, p.178

Table 2.3.2 Australian Gross Domestic Product Projections

Projecting Institution	14/15	15/16	16/17
The RBA Upper Limit Projections (GDP) as at Dec 14[16]	3.0%	3.5%	
The RBA Lower Limit Projections (GDP) as at Dec 14[17]	2.0%	2.5%	
Commonwealth Budget (GDP) as at Dec 14[18]	2.5%	3.0%	3.5%
The Commonwealth Bank (GDP) as at Dec 14[19]	2.3%	2.8%	

[16] The Reserve Bank of Australia, Statement on Monetary Policy – 6 November 2014, p.61
[17] The Reserve Bank of Australia, Statement on Monetary Policy – 6 November 2014, p.61
[18] Commonwealth 2014/15 Mid-Year Economic and Fiscal Outlook, 15 December 2014, p.16
[19] The Commonwealth Bank of Australia Economic Perspective, 19 December 2014, p.14

2.4 DATA ISSUES

Prior letter volume demand studies in this series have always been premised upon obtaining appropriate data that is reflective of the hypotheses developed. In some cases the desired data was either not publicly available or possessed a redundancy issue.

Additionally, for some of the explanatory variables assessed previously, data sources had been discontinued or were not forthcoming on a quarterly basis.

Where data issues were considered problematic, such data was not included in the analytical process.

Where data was limited, such data was included in the analytical process in the absence of a superior set of measurements. Moreover, where such data is used its limitations are duly noted and acknowledged.

This section provides an example of a number of data sets constructed for the purpose of this study in the absence of suitably available direct metric measurements.

2.4.1 IPO Variable Construction

The sending of prospectuses relating to large scale share floats or initial public offerings (IPO's) are generally expected to have an impact upon PreSort large letter volumes.

There exists no direct measure of the letter volumes associated with these offerings and therefore Diversified Specifics, for the purposes of this study developed a metric variable to act as a suitable proxy.

Using source data from the Australian Stock Exchange (ASX) a feasible set of suitably large IPO's were identified and a variable was constructed based on current value market capitalisations.[20]

In estimating the PreSort large letter volume vector error correction model the IPO variable was assigned to an estimated mail-out date rather than the IPO listing date according to research suggesting associated prospectus' mail-outs tend to have 3-4 weeks lead time into the public offering date.[21]

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[20] Sources: The Australian Stock Exchange, www.asx.com.au and the Australian Financial Review Online, http://www.afr.com/share_tables/#weekly_tables as at February 2015. Although both market capitalisation valuations and the firms contained within the ASX Top 300 companies are subject to change over time their current values were utilised in the construction of this variable to obtain an indicative estimate.

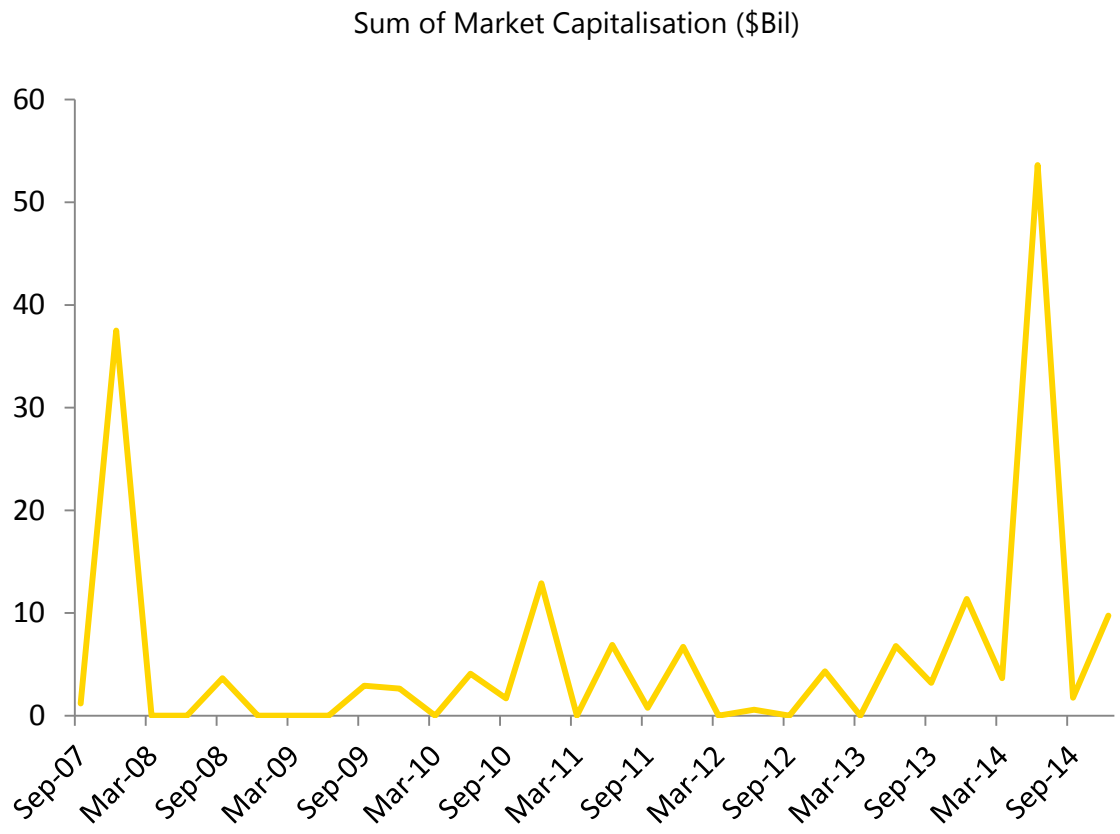
[21] As indicated on the Australian Stock Exchange website, www.asx.com.au

A value of zero was registered for each of the quarters absent of any IPO's emanating from eventual Top 300 companies.

A caveat on the use of this variable is its limitation should a substantial number of smaller IPO's occur simultaneously in one of these quarters, although research efforts suggested this to be an unlikely eventuality.

In total, there were 929 IPO's that occurred over the 2006 to 2014 period with 81 of these relating to ASX Top 300 companies. The corresponding market capitalisations are illustrated in Chart 2.4.1.1.

Chart 2.4.1.1 Large Initial Public Offerings



2.4.2 Alternative Measures of Substitution

There is no single variable that precisely measures the phenomena of electronic substitution away from the traditional letter item across and within each letter volume segment.

There are instead a number of electronic communication channels that emerge at different times each at varying stages of development and penetration.

Technological change whilst necessary is not a sufficient condition for substitution because it is the behaviours of senders and receivers that dictate the ultimate success or failings of each channel via their willingness to accept a particular mode of communication.

Quantifying substitution depends directly upon the nature of this interaction between technological advances and the behavioural changes made by senders and receivers.

For some categories direct proxies are readily available, such as utilising cheque volume numbers to illustrate how bill payments via the post have migrated across to alternative technologies such as that given by the various phone and internet channels.

For other segments such as PreSort small letter volumes measuring the electronic substitution of bill presentment type mail away from a traditional letter item requires a more nuanced approach.

This is because whilst actual threats to bill presentments are now occurring in the areas of substitution, consolidation and rationalisation it is the technologies that are likely to have the largest impact, such as the various incarnations of digital mailboxes that are still in the formative stages of development.

Yet these technologies are extremely likely to represent the next wave of substitution and have a substantial impact on PreSort small letter volumes over the forecast horizon.

It therefore becomes necessary to capture the forces of aggressive present and future rates of electronic substitution with variables that reflect the changing nature of technological and behavioural change.

The increased popularity of tablets, smartphones and cloud technology are all expected to make greater use of wireless broadband capabilities over the next four or five years.

This study undertakes the construction of a mobile wireless variable to act as an indicative quantification of these multiple waves of actual and likely substitution in order to facilitate the estimation and forecasting requirements of this project.

To this end, the wireless mobile substitution variable developed in this study is based on a combination of:

1. The Australian Bureau of Statistics measure of mobile wireless broadband connections. This is a quarterly data set encompassing the March 2008 to September 2014 timeframe;[22] and

2. The set of global mobile traffic projections pertaining to the Asia-Pacific region as given by Cisco. These annual projections commence in 2011 and extend to 2016.[23]

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[22] Australian Bureau of Statistics (2014), ABS Cat No. 81530do001_201406 Internet Activity, Internet subscribers by type of access connection, for ISP's with more than 1,000 subscribers, Mobile Wireless, Australia, December 2010 and June 2014

The following steps were employed to construct a quarterly series that is intended to capture the significant year on year growth in actual and anticipated movements away from the traditional letter item over both the estimation and forecast periods.

Initially, a log-trend model was estimated using the annualised global mobile traffic projections for the Asia-Pacific region. The estimated model is presented in Table 2.4.2.1.

Table 2.4.2.1 Trend equation for global mobile traffic projections in the Asia-Pacific

Dependent Variable: LOG(MOBILE_ANNUAL)
Method: Least Squares
Date: 02/13/15 Time: 19:10
Sample: 2011 2016
Included observations: 6

Variable	Ct	Std. Error	t-Statistic	Prob.
C	5	0.064670	190.8530	0.0000
@TREND(2011)	196	0.021360	28.33346	0.0000

R-squared	0.995042	Mean dependent var	13.85544
		S.D. dependent var	1.135036
S.E. of regression	0.993803	Akaike info criterion	-1.731213
Sum squared resid	0.089354	Schwarz criterion	-1.800626
Log likelihood	0.031937	Hannan-Quinn criter.	-2.009081
F-statistic	7.193638	Durbin-Watson stat	1.163615
Prob (F-statistic)	802.7852		

The estimated trend model was then utilised to forecast the global mobile traffic series through to the completion of the forecast period, 2017 Q2 in order to generate an annual series.

This annual series was then interpolated to generate the quarterly frequency required in the construction of the relevant econometric models.

Additionally, a log-trend model was also estimated using the quarterly Australian Bureau of Statistics measure of mobile wireless broadband connections. The estimated model is presented in Table 2.4.2.2.

[23] Cisco (2012), '*Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update', 2011–2016,* Asia Pacific Mobile Data Traffic, p.24

Table 2.4.2.2 Log-Trend equation for the ABS mobile wireless broadband connections

Dependent Variable: LOG(MOBILE_QUARTERLY)
Method: Least Squares
Date: 02/13/15 Time: 18:55
Sample: 2008Q3 2012Q2
Included observations: 16

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.704358	0.087654	76.48635	0.0000
@TREND(2007Q1)	0.102481	0.006145	16.67825	0.0000

R-squared	0.995042	Mean dependent var	8.087846
Adjusted R-squared	0.993803	S.D. dependent var	0.500033
S.E. of regression	0.089354	Akaike info criterion	-1.401084
Sum squared resid	0.031937	Schwarz criterion	-1.304510
Log likelihood	7.193638	Hannan-Quinn criter.	-1.396138
F-statistic	802.7852	Durbin-Watson stat	0.297319
Prob(F-statistic)	0.000009		

Finally, the two series were spliced together at 2012 Q2 in accordance with the commencement of a plateau in the Australian Bureau of Statistics mobile wireless data after which its applicability as an appropriate proxy for aggressive present and future electronic substitution becomes questionable.

As a result the annual growth rates in the variable constructed then align with those of the of global mobile traffic projections pertaining to the Asia-Pacific region the over the forecast period.

Intuitively, this supports the rationale that infrastructure (number of connections) predates the traffic flows that will drive the next wave of electronic alternatives to the traditional letter item.

These projected rates of growth are outlined in Table 2.4.2.3.

Table 2.4.2.3 Global Mobile Traffic Projections in the Asia-Pacific Region

	Annual Growth Rate
2013/14	87.7%
2014/15	78.9%
2015/16	71.6%
2016/17	75.5%

2.4.3 The Health of the Advertising Industry Index

In the absence of a direct measurement reflecting the health of the advertising industry a broader measure is employed within this study as it had in a number of prior studies of this kind.

The index is based on fluctuations in the Standard and Poor's/Australian Stock Exchange (S&P/ASX) Top 200 Consumer Discretionary Index.

As with any broad measure, the scope and coverage of this variable is indicative of the health of the advertising industry rather than acting as a direct measure of promotional activity.

In particular, the S&P/ASX 200 Consumer Discretionary Index reflects a range of industries and includes the media industry. As stated on the Australian Stock Exchange's website:

"*The S&P/ASX 200 Consumer Discretionary Index (XDJ) encompasses those industries that tend to be the most sensitive to economic cycles. Its manufacturing segment includes automotive, household durable goods, textiles and apparel and leisure equipment. The services segment includes hotels, restaurants and other leisure facilities, media production and services, and consumer retailing and services.*"[24]

The index therefore, reflects (among other things) general economic conditions in the media industry.

That said, its correlation with the former ASX Media Index was near one where daily data for both indices were available.

[24] Source: The Australian Stock Exchange, www.asx.com.au

3. OTHER SMALL LETTERS

3.1 BACKGROUND

The majority of Australia Posts letter volumes are transactional mail which consists of bill presentments, notices of terms and conditions, contracts, announcements of price changes and bill payments.

The first real sign of electronic substitution away from the traditional mail item began to impact bill payment type mail in the 1990's.

These pressures manifested themselves in the form of a sustained yet gradual decline in Other (Ordinary) small letter volumes with the downward trends continuing until the present day.

This Other (Ordinary) small letter segment category consists of full rate business mail, cheque payments and other consumer correspondence that satisfy the relevant small letter category size and weight requirements as set by Australia Post.[25]

Presented in Table 3.1.1 are the annual percentage changes since 2000/01 for each of the Other (Ordinary) small letter volume hypothesised drivers considered in this study.

The contents of Table 3.1.1 provides clear evidence of substitutive pressure as cheque volumes, the traditional mechanism for bill payments has continued to decline over a lengthy period of time.

Explaining this long run decline in letter based bill payment volumes was the proliferation of phone and internet based channels that began to emerge and garner wider rates of penetration for those interested in settling an invoice.

Additionally, direct debit transfers have also climbed over the same period reflecting an increasing propensity on behalf of the bill recipients to settle any outstanding transactions via alternative non-mail based platforms.

Chart 3.1.1 illustrates the longer run trends in these alternative bill payments modes since the early 2000's when the Reserve Bank of Australia commenced the data collection of cheque volumes.

Indeed, the Australian Payments Clearing Association estimates one third of all non-cash payments in Australia are now direct credits and direct debits.[26]

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[25] The dominant letter product sub-categories comprising Other small letters are 'Ordinary Letters', 'metered / imprint letters' and 'Clean Mail'.

[26] Australian Payments Clearing Association website, http://www.apca.com.au

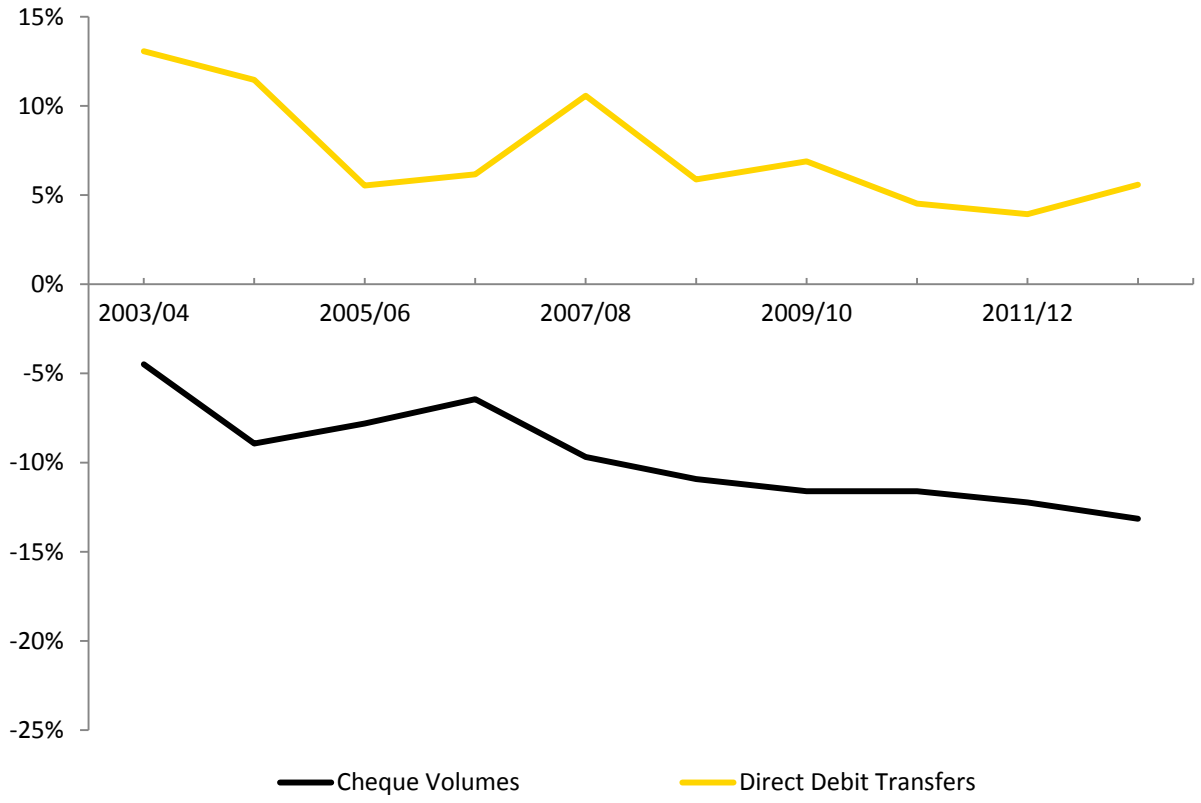
Table 3.1.1 Percentage Changes
Other (Ordinary) Small Letter Volumes & Hypothesised Drivers

	Sep 2013 to Sep 2014 % Change	Average Annual % Change	
		2000/01 to 2007/08	2007/08 to 2012/13
Other (Ordinary) Small Letter Volumes	-7.32%	-1.70%	-6.97%
Cheque Volumes	-14.13%	-7.49%*	-11.91%
Direct Entry Payments for Debit Transfers	13.19%	9.32%*	5.33%
Australian Non-farm GDP	2.65%	3.63%	2.41%
Real Price of Other (Ordinary) Small Letters	14.04%	-1.44%	1.35%
Estimated Australian Population	N/A	1.40%	1.71%

* The average annual growth rate for these variables is calculated from 2002/03 due to data availabilities.

Chart 3.1.1 Changing Bill Payments Behaviour in Australia

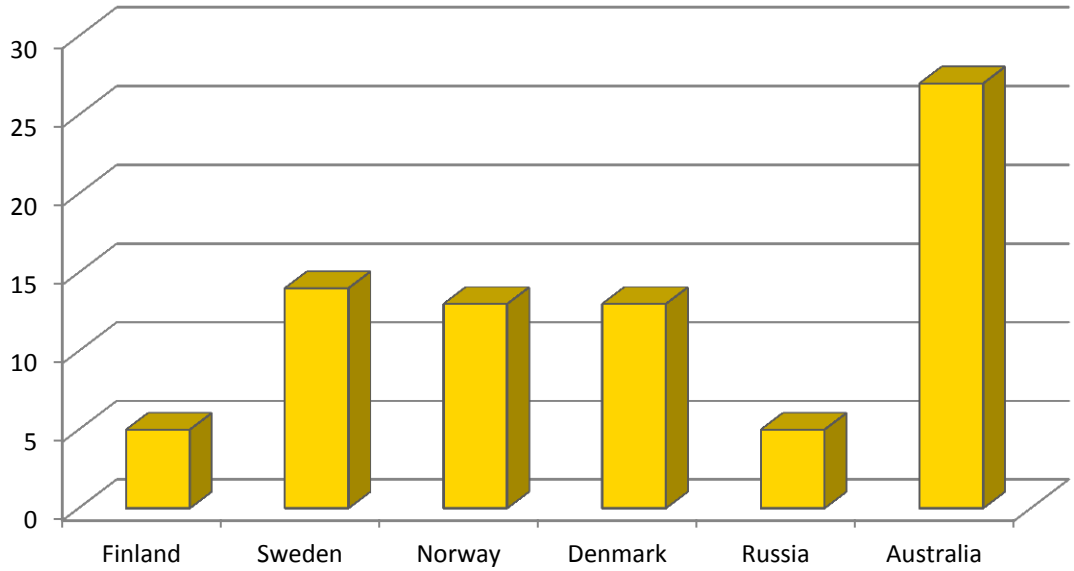
Annual percentage change across the various channels



Source: Reserve Bank of Australia.

Recipient survey data (illustrated in Chart 3.1.2) from a 2014 study conducted by Itella and Diversified Specifics also highlights the comparatively high usage rates in Australia of automated payments channels when contrasted to a selection of other countries.[27]

Chart 3.1.2 Direct Debits as a Proportion of Total Bill Payments (%)



Source: Diversified Specifics & Itella.

Following 2007/08 the declines in Other (Ordinary) small letter volumes have accelerated and this can reasonably be attributable to a proportion of this segment consisting of bill presentments at the owner-operator and SME level.

This 'presentment' segment of Other (Ordinary) small letter volumes are impacted in a similar way to the bulk presentments of the PreSort small letter volume segment, a discussion of which may be found in Section 4 of this document.

In terms of electronic bill payments, Other (Ordinary) small letter volume electronic substitution is unlikely to abate throughout the forecast horizon.

Indeed, although there has been a trend to this point in migrating bill payments towards an electronic alternative away from the traditional letter, more evidence presently suggests that in some industries this movement is now becoming compliance driven rather than as a result of choice.

As an example, the Australian Tax Office intentions with respect to its 'Data and Payment Standards' legislation for electronic contributions suggest a phased mandatory requirement

[27] Paterson C.J, Elkelä K and,Nikali (2014), 'Digitalization of consumer invoices: a comparative study' in The Role Of The Postal And Delivery Sector In A Digital Age, M.A. Crew and Timothy J. J. Brennan (eds), Edward Elgar Publishing.

for employers to pay super contributions and provide information about their employees electronically.[28]

This legislation extends to both the payment medium and any associated data correspondence.

As this change is implemented, per the transition timeline outlined in Table 3.1.2, it is expected to add increased downward pressure on the Other (Ordinary) small letter volume segment.

Table 3.1.2 Current ATO Transition Timeline by Employer Size

Number of employees	Transition start date	Transition end date
20 or more	1 July 2014	30 June 2015
19 or less	1 July 2015	30 June 2016

[28] Source: The Australian Taxation Office website, www.ato.gov.au

3.2 ELASTICITY ESTIMATES

3.2.1 Overview

The methodological approach to constructing the Other (Ordinary) small letter volume vector error correction model is outlined in Appendix A of this document (Appendix C.1 contains the associated statistical output).

The preferred model explains 98.9% of the total quarterly variation in Other (Ordinary) small letter volumes over the June 2002 to September 2014 timeframe.[29]

3.2.2 Long Run Market-based Volume Drivers & Elasticity Estimates

Presented below are the historical demand drivers together with the relevant demand elasticities:

1. **Electronic substitution away from traditional modes of bill payments:**

Reductions in cheque volumes broadly suggest a movement away from utilising the traditional mail item for bill payments which also leads to declining Other (Ordinary) small letter volumes.

Elasticity[30]: A 1% decrease in cheque volumes was associated with a 0.51% decrease in Other (Ordinary) small letter volumes on average in the long-run.

Recent Trend: Cheque volumes have decreased at an annual average rate of 9.7% from 2002/03 to 2012/13 and by 14.1% in the 12 months prior to September 30, 2014.

2. **Real price:**

Rational economic theory suggests the real cost (i.e. price adjusted for inflationary effects) of sending Other (Ordinary) small letter mail will be inversely related to demand.

Price changes over the examined time frame have been significantly associated with demand responses in the contrary direction.

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[29] Based upon Adjusted R-squared calculations:

$\bar{R}^2 = 1-(1-R^2)\frac{T-1}{T-K-1}$ where $R^2 = \frac{\text{Explained sum of squares}}{\text{Total of sum of squares}} = 1-\frac{\sum e_t^{\,2}}{\sum (Y_t-\bar{Y})^2}$

[30] All elasticities are estimated at their mean and are applicable only to the timeframe over which the econometric models have been developed. In interpreting the elasticities within this document it is assumed all other factors are held constant.

Elasticity: A 1% increase in the real price of sending Other (Ordinary) small letters was associated with a 0.41% decrease in Other (Ordinary) Small Letter volumes on average in the long-run.

Predictor Variable Recent Trend: Real price has decreased at an annual average rate of 0.3% from 2000/01 to 2012/13 although given recent increases in the basic postal rate it has increased by 14% in the 12 months prior to September 30, 2014.

3.3 BASELINE FORECASTS

3.3.1 Preamble

The statistically significant Other (Ordinary) small letter volume drivers over the 2002 Q2 to 2014 Q3 timeframe are:

- **Substitution:** In the VECM bill payments type substitution away from the traditional mail item is captured by cheque volumes. It's decline is utilised as a proxy for declines in all traditional forms of bill payments and inversely, the growth in popularity of direct debit payment options; &

- **Price:** A combination of inflationary real price declines and nominal price increases.

3.3.2 Driver Projections Utilised

A series of projected values on each of the relevant drivers within the VECM framework are required for forecasting and these include:

- A cheque volume decline of 14.1% which is set at a constant rate across the projection period. This value reflects the September 2013 to September 2014 percentage change which is selected in the absence of any externally available projections.

- CPI projections resulting in real price changes of -2.5% per annum over 14/15 to 16/17 as given by the Commonwealth Budget have been utilised as proxies for the inflationary rate of change contained within the real price projections.

- Nominal increases to the basic postal rate are assumed within the forecasting process (As provided by Aust. Post.).

  Importantly, the contingencies examined do not account for any changes in demand resulting from an alteration in Australia Posts required Other (Ordinary) small letter delivery service standards.

  Nor do the scenarios illustrate any possible cross segment volume migration that would be expected from the introduction of the Regular and Priority timetables.

3.3.3 Econometric Baseline Volume Projections

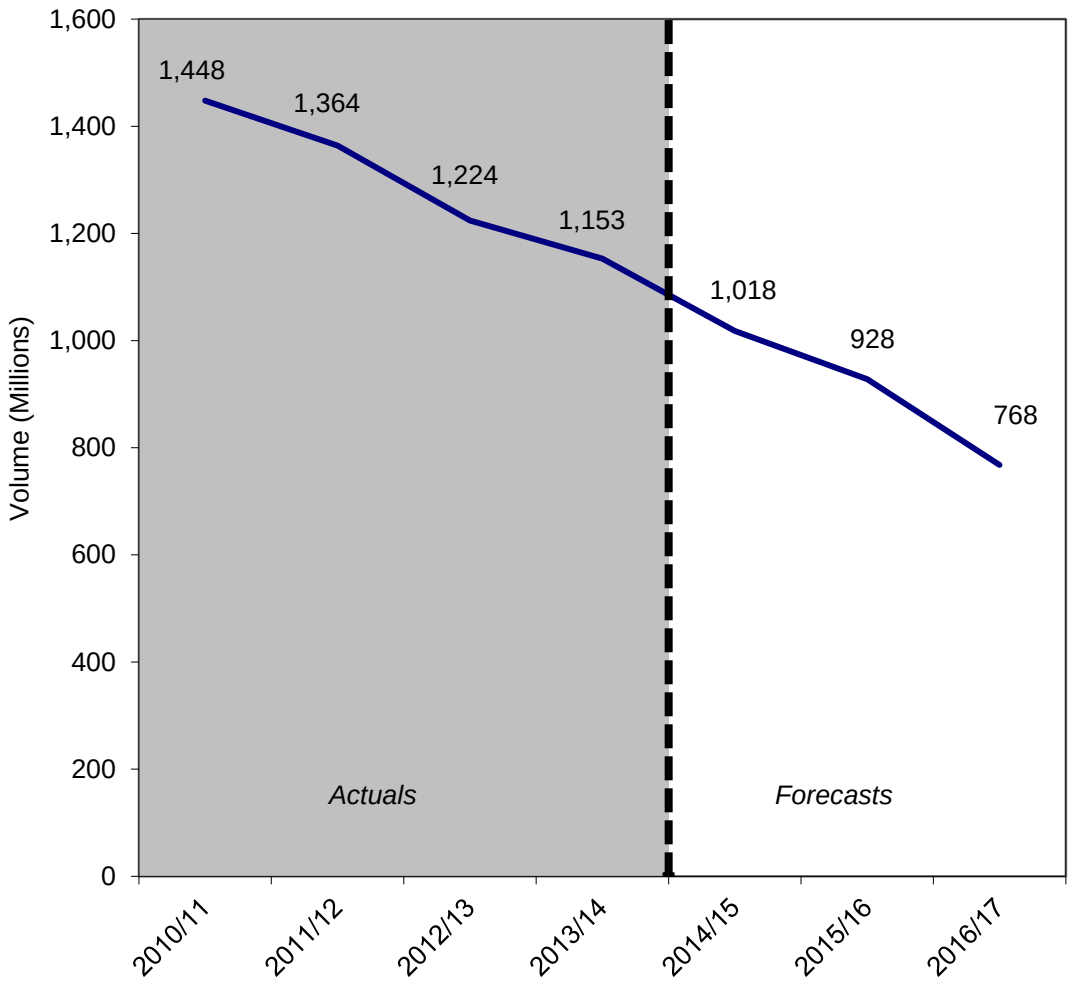
Other (Ordinary) small letter *ex-ante* baseline forecasts are presented in Table 3.3.1.1 and Chart 3.3.3.1 in this section.

Year on year declines greater than 8% in Other (Ordinary) small letter volumes are anticipated to continue over the forecast period (See Table 3.3.1.1).

Table 3.3.3.1 Other (Ordinary) Small Letter Volumes
Econometric Forecast Percentage Changes

	Forecast Volume Decline
2014/15	-11.7%
2015/16	-8.9%
2016/17	-17.2%

Chart 3.3.3.1 Other (Ordinary) Small Letter Volumes
Historical & Forecast



4. PRESORT SMALL LETTERS

4.1 BACKGROUND

The 'PreSort 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.[31]

Prior to 2007/08 PreSort small letter volume fluctuations was characterised by a strong correlation with the level of Australian economic activity.

The majority of mail in this category was presentments experiencing healthy year on year volume growth as a result of lifestyle changes on behalf of Australian consumers.

These changes included increases in the number of mobile phones, increasing numbers of bank accounts, an expansion in secondary credit cards and so on. Each of these lifestyle changes tended to be accompanied by an additional invoice and/or statement.

In late 2008 with the collapse of Lehman Brothers, the largest bankruptcy in the history of the United States and the onset of the global financial crises all letter volume segments at Australia Post began to register annual declines.

Under such circumstances PreSort small letter volume models predicted these declines reasoning that as the level of economic activity slowed then fewer transactions in the economy would result in few bill presentments, all other factors remaining constant.

Certainly there was some truth to this cyclical explanation however the downturn also acted as a catalyst for structural change that would ultimately have a negative impact upon bulk bill and statement letter volumes.

This change came in the form of an increasing propensity for cost containment strategies on the part of senders and meant that beyond 2007/08 the postal industry was subjected to a new wave of emerging threats.

These downside pressures involved senders becoming increasingly likely to investigate letter volume consolidation, rationalisation and substitution practices. Firms were attempting to maintain their profit margins via cost reductions in the face of the diminishing sales.

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[31] The dominant product category within the PreSort small letter segment is business transactional PreSort Letters.

As distinct from other letter segments the decreases in bulk bill presentment letter volumes were not entirely attributable to substitutive pressures.

Consolidation and rationalisation practices do not necessarily imply senders are actively substituting away from mail *per se*.

Although firms might be decreasing their exposure to paper based forms of communications, tendencies towards consolidation and rationalisation practices are reflective of a strong sender-recipient value component that accords the letter item at a promotional level.

As Section 4.4 in this document suggests, this 'value' of the traditional letter item does appear to differ depending upon the originating industry.

However, although Diversified Specifics cross sectional surveys have indicated recipient's preferences for the physical letter item still remains strong it is the sender's motivations and actions that will ultimately dictate the future of PreSort small letter volumes.

Those senders who are motivated by achieving cost reductions are likely to engage in a range of tactics aimed at engendering some form of behavioural shift on the part of the recipient to encourage the use of substitutive platforms until they become the only feasible option.[32]

While full scale structural change in the realm of bill presentments has not yet occurred the recent and sustained slide in PreSort small letter volumes indicates this process is underway.

Indeed, a number of online presentment portals are in various stages of development and operation.

Australia Post themselves are actively engaged in attempting to cultivate their own niche within the electronic bill presentments landscape with products such as the Digital MailBox representing its own alternative to the traditional physical letter items for those customers seeking to change.

Additionally, the '*MyGov*' online portal is actively seeking to digitize governmental correspondence and this will directly affect PreSort small letter volumes (See Section 4.4 of this document) through the forecast horizon over and above those declines predicted by any empirical based modelling.

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[32] Examples of these push and pull tactics can involve the imposition of a surcharge for the provision of a paper based bill or the compulsory use of a direct debit arrangement as a condition of a new service agreement or product offering.

Presented in Table 4.1.1 are the annual percentage growth rates since the year 2000/01 for each of the hypothesised PreSort Small Letter volume drivers.

The table highlights the movement from a period of decreases in real price towards a tendency for nominal price increases.

Table 4.1.1 Percentage Changes
PreSort Small Letter Volume & Hypothesised Drivers

	Sep 2013 to Sep 2014 % Change	Average Annual % Change	
		2000/01 to 2007/08	2007/08 to 2012/13
PreSort Small Letter Volumes	-6.2%	2.7%	-3.4%
Australian Non-farm GDP	2.7%	3.6%	2.4%
Advertising Industry Health Measure	6.8%	-4.3%	-3.5%
Credit Card Volumes	1.5%	5.6%	1.9%
Retail Trade Industry	2.0%	5.0%	2.1%
Real Price of PreSort Small Letters	11.8%	-2.6%	2.2%
Estimated Australian Population	N/A	1.4%	1.7%
Consumer Sentiment	-3.7%	0.4%	-0.3%
Business Confidence	11.3%	-2.6%	1.2%
Domestic Broadband Index	1.9%	59.5%*	16.5%

* The average annual growth rate for this variable is calculated from 2002/03 due to data availabilities.

The annual average decline of -2.6% in real price between 2000/01 and 2007/08 was largely in line with inflationary increases however across the 2007/08 to 2012/13 period multiple nominal price rises resulted in an average annual rate of change of 2.2%.

Table 4.1.1 highlights the softer post 2007/08 set of growth rates for each of the hypothesised transactional macroeconomic indicators (retail trade and GDP) for PreSort small letter volumes.

Interpretations of the apparent inverse relationship between price and letter volumes must be cautioned by these figures as a significant portion of the initial letter volume declines occurred as a direct result of the income effects associated with the global financial crisis of 2008.

That downturn played a crucial role in reducing the number of transactions within the economy to drive down PreSort small letter volumes and reinforce the impetus towards developing alternative electronic communication channels for cost conscious firms.

Within the final preferred econometric models the level of economic activity now tends to be crowded out by the effects of electronic substitution.

This however does not diminish the economic significance of slowdowns in GDP being a key catalyst in the decisions that motivate any movement towards encouraging the development of electronic communication channels.

4.2 ELASTICITY ESTIMATES

4.2.1 Overview

The methodological approach to constructing the PreSort small letter volume vector error correction model and the progression to a dynamic ordinary least squares (DOLS) model is outlined in detail within Appendix A of this document.

Tables C.1.2 and Table C.4.7 within Appendix C.1 contain the associated statistical outputs for the respective frameworks.

The PreSort small letter model explains 84.8% of the total quarterly variation in PreSort small letter volumes over the September 2008 to September 2014 timeframe.

4.2.2 Long Run Market-based Volume Drivers & Elasticity Estimates

Presented below are the historical demand drivers together with the relevant demand elasticity:

1. **Real price:**

The real cost (i.e. price adjusted for inflationary effects) of sending a PreSort small letter is inversely related to demand. Price changes in the examined time frame are significantly associated with demand responses in the contrary direction.

Elasticity: A 1% increase in the real price of sending a PreSort small letter was associated with a 0.35% decrease in PreSort Small Letter volumes on average over the long-run.

Recent Trend: The real price of a PreSort small letter decreased at an annual average rate of 0.7% from 2000/01 to 2012/13 however increased by 11.8% in the 12 months prior to September 30, 2014.

2. **Electronic presentments substitution facilitated by mobile broadband growth:**

The structural change effects of substitution, consolidation and rationalisation away from the traditional mail item in the realm of bill presentments gained added impetus following the onset of the global financial crisis in 2008. Growth in mobile broadband penetration levels are used to proxy these structural change effects.

Elasticity: A 1% increase in mobile broadband connections was associated with a 0.05% decrease in PreSort Small Letter volumes on average over the long-run.

Recent Trend: Mobile broadband traffic in the Asia Pacific is projected to have grown by 112.8% over the 2012/13 financial year.

4.3 BASELINE FORECASTS

4.3.1 Preamble

The statistically significant PreSort small letter volume drivers over the timeframe of 2008 Q1 to 2014 Q3 are:

- **Price:** A combination of inflationary real price declines and nominal price increases; &
- **Substitution:** The widespread use of tablets and smartphones in recent times has been facilitated by wireless broadband technology. This creates a wider potential audience for a range of electronic alternatives to traditional modes of bill presentments such as the PreSort small letter.

4.3.2 Driver Projections Utilised

A series of projected values on each of the relevant drivers within the DOLS framework are required for forecasting and these include:

- CPI projections resulting in real price changes of -2.5% per annum between 2014/15 and 2016/17 are given by the Commonwealth Budget and have been utilised as proxies for the inflationary rate of change contained within the real price projections.
- The nominal price changes for PreSort small letter volumes are derived by taking a volume weighted linear combination of the proposed Regular & Priority price changes.[33]
- The scenarios constructed do not provide any explicit treatment of possible cross segment volume migration resulting from the asymmetrical pricing policies across service speeds.
- The Mobile Broadband traffic growth rate is set to the anticipated quarterly growth rate derived utilising projections on global mobile traffic in the Asian Pacific region of 78.9% in 2014/15, 71.6% in 2015/16 and 75.5% in 2016/17.

[33] The magnitude of the respective changes were provided by Australia Post.

4.3.3 Econometric Baseline Volume Projections

The PreSort small letter *ex-ante* baseline forecasts are presented in Table 4.3.3.1 and Chart 4.3.3.1 in this Section.

Table 4.3.3.1 PreSort Small Letter Volumes
Econometric Forecast Percentage Changes

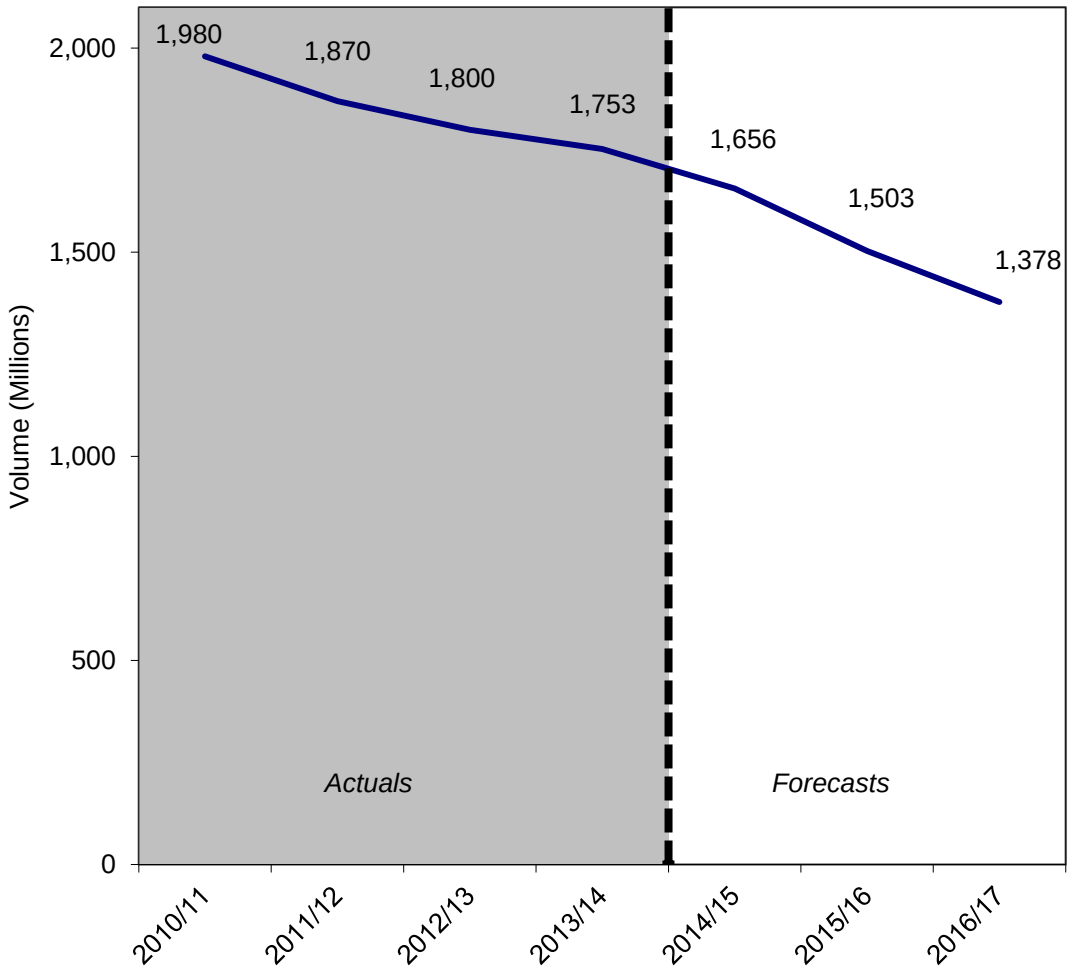
	Forecast Volume Decline
2014/15	-5.5%
2015/16	-9.3%
2016/17	-8.3%

This segment consists of a large portion of bill presentment volumes and, along with the Other (Ordinary) small letter category, will most likely to be impacted by the emerging threats to the traditional mail item over the next few years.

Although this research undertaking assumes all structural change losses are substitutive, efforts at individually identifying the substitution, consolidation and rationalisation components should be cultivated to form additional intelligence that might provide further insights into the exact nature of the volume losses.

Acknowledging the existence of consolidation and rationalisation pressures, Diversified Specifics has defined all bill presentment volume losses quantified under the term '*substitution*' purely for the purposes of simplifying the downward trends.

Chart 4.3.3.1 PreSort Small Letter Volumes
Historical & Forecast



4.4 THE LIKELIHOOD OF ACCELERATED DECLINE

Delineating Australia Post's PreSort small letter volumes into its major industry classifications suggests some industries are very likely to be at risk to significant levels of mass electronic substitution that cannot be predicted via historical trends alone.

The revenue based volume data that constitutes the primary Australia Post data source utilised within this report does not facilitate a dissection on letter volumes down to this level of delineation.

In contrast the ComOPS (START / PGA) volume data set permits the observation of industry segmentation for the majority of Australia Post's business charge account customers.[34]

The fundamental allocation process employed by ComOPS rests upon the Australian and New Zealand Standard Industrial Classification (ANZSIC), 1993 structure. [35]

Information is collected when a customer applies for a business charge account that identifies the "Business Activity" and "Industry Type".

Once an account is set up and transactions are recorded, Australia Post may slice "billing" data at both a Division (e.g. A, B, C) and Code Level (e.g. G5251 pharm, cosm, toiletry).

The code structure is based on a concatenation of the ANZSIC Division, Subdivision, Group and Code Structure to use G5251 as an example this represents the following concatenation: Division = G "Retail Trade", Subdivision = 52 "Personal and Household Good Retailing", Group = 525 "Other Personal and Household Good Retailing" and Code = 5251 "Pharmaceutical, Cosmetic and Toiletry Retailing".

Mechanisms governing the customer lodgement process at Australia Post create significant difficulties in allocating every PreSort small letter service customer into a unique industry category.

At an aggregated level any given "Customer" may fall in a number of ANZSIC segments.

For instance a major bank might not only be listed as a member of the 'Finance and Insurance' industry classification yet may fall under 'Property and Business Services' as part of their broader business portfolio.

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[34] The classification methodology does not allocate 100% of charge account volumes into accurate industry categories. For example, within this data set 'EPOS Cash' purchases are classified as 'Unknown'.

[35] This classification system was updated in 2006 with slight changes to the 1993 ANZSIC structure.

In addition, some volumes of that same bank, if engaged in outsourcing some of its mailing activities to a 'Mail House' would then fall under the industry segment of 'Communication Services'.

This implies the letter volumes/revenue of a given company might be spread across more than one industry segment, dictated by the nature of the charge account employed to conduct billing.

The largest industry classifications within the PreSort small letter ComOPS or charge account volume segment are presented in Table 4.4.1.

Table 4.4.1 PreSort Small Letter Volumes – Major Industry Classifications

	Share of the Total (Feb 2014 to Feb 2015)
Financial and Insurance Services	30%
Communication Services	26%
Public Administration and Defence	16%
Electricity, Gas, Water Supply	8%

The different rates of growth observed within each industry segment over the past few years are highlighted in Table 4.4.2.

Table 4.4.2 PreSort Small Letter Volume – Growth Rates by Industry

	2011/12	2012/13	2013/14
Financial and Insurance Services	6.7%	-0.2%	-0.5%
Communication Services	-13.0%	-8.8%	-9.0%
Public Administration and Defence	-9.8%	-6.8%	-4.9%
Electricity, Gas, Water Supply	-3.8%	-0.2%	-1.3%

A number of factors explain why there is such a divergence in letter volume growth at an industry level.

Firstly, there is a diversity of substitutive pressures due to a variety of electronic platforms, some specific to certain classifications of recipients (e.g. government versus private).

Additionally, the behavioural characteristics of the sender and receiver within each industry group may differ according to the value placed on the privacy, intent (promotional, transactional or trans-promo) and customer relations components of the communications.

It is important to recognise in the realm of 'presentment' type mail, not all declines are simply due to electronic substitution away from the traditional letter item.

In some industries consolidation and rationalisation pressures represent additional threats to the paper based letter item that allow the sender to decrease their exposure to mail without exiting the letter channel completely.

In other industries, remaining loyal to the letter item is less of an issue when minimising the cost of conveying the message represents a greater concern than ensuring the retention or cultivation of an effective promotional channel.

The following sub-sections outline the trends and likely developments occurring at an industry level within the PreSort small letter volume segment.

4.4.1 Public Administration and Safety

There have been a number of examples internationally whereby government led digitization has resulted in mass electronic substitution away from the traditional letter item.[36]

All indications suggest public administration PreSort small letter volumes are likely to be significantly threatened over the forecast horizon by the increased development, penetration and government support of the *MyGov* portal.

This quasi-digital mail box has already generated significant registrations and support from the largest government originating senders including the Department of Human Services (Centrelink, Medicare and Child Support), the Department of Health, the Australian Taxation Office, the Department of Veterans' Affairs and the National Disability Insurance Scheme.

The following examples demonstrate the use of the *MyGov* portal as an emerging electronic alternative to the traditional PreSort small letter item: [37]

- Between March 29, 2014 and June 30, 2014 the *MyGov* Inbox sent 10,306,632 letters online.
- Medicare letters online commenced with the implementation of *MyGov* Inbox on March 29, 2014.
- 2,358,107 customers were registered to receive letters online with the Department of Human Services as at 2013/14 (up by 31% on 2012/13 and by 110% on 2011/12);

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[36] See: The digital path to future welfare (2011), eGOVERNMENT strategy 2011-2015, The Danish government/Danish Regions/Local Government Denmark

[37] Source: www.humanservices.gov.au

- The volume of Centrelink, Medicare and Child Support mail house letters fell by 29% in 2013/14, and by 38% compared to 2011/12 volumes. Conversely, total letters online increased by 37.8% in 2013/14, and by 119% compared to 2011/12 volumes.

Eighty percent of eligible customers have not yet registered for *MyGov*, therefore as the portal garners a broader recipient base the impact on PreSort small letters will become increasingly evident.

Indeed, any strategies employed by governmental departments to coerce or stream recipients into *MyGov* will necessarily expedite the migration away from the traditional letter item.[38]

The government has embarked on a strong promotion of *MyGov* platform for all levels of government.

Initiatives in advancing the digital economy & e-Government within Australia suggest that virtually all government services and public interactions are to be available digitally (as well as in hard-copy) by 2017 on an opt-in basis.[39]

Use of *MyGov* for all levels of government is provided free of charge which is likely to incentivise a broader base of public administration letter senders to utilise the portal.

Given the public administration and security component of PreSort small letter volumes accounts for approximately 16% of the total (as per Table 4.4.1) this could have significant downside letter volume implications if widespread adoption occurs at a rate comparable to that signalled by the Commonwealth government.

Utilising the projections from Section 4.3.3, Chart 4.4.1 illustrates a possible scenario depicting relatively severe declines in PreSort small letter volumes should the proportion of government related mail migrates to a digital portal such as *MyGov* over the forecast horizon.

As at 2013/14 the 16% attributable to the Public Administration and Safety component of PreSort small segment equates to 281.2 million letter volumes.

In the scenario outlined in Chart 4.4.1 it is assumed that each year this value is progressively discounted by 25% until 2016/17 at which point the equivalent number of PreSort small letter volumes that might be classified as Public Administration and Safety would be 119 million.

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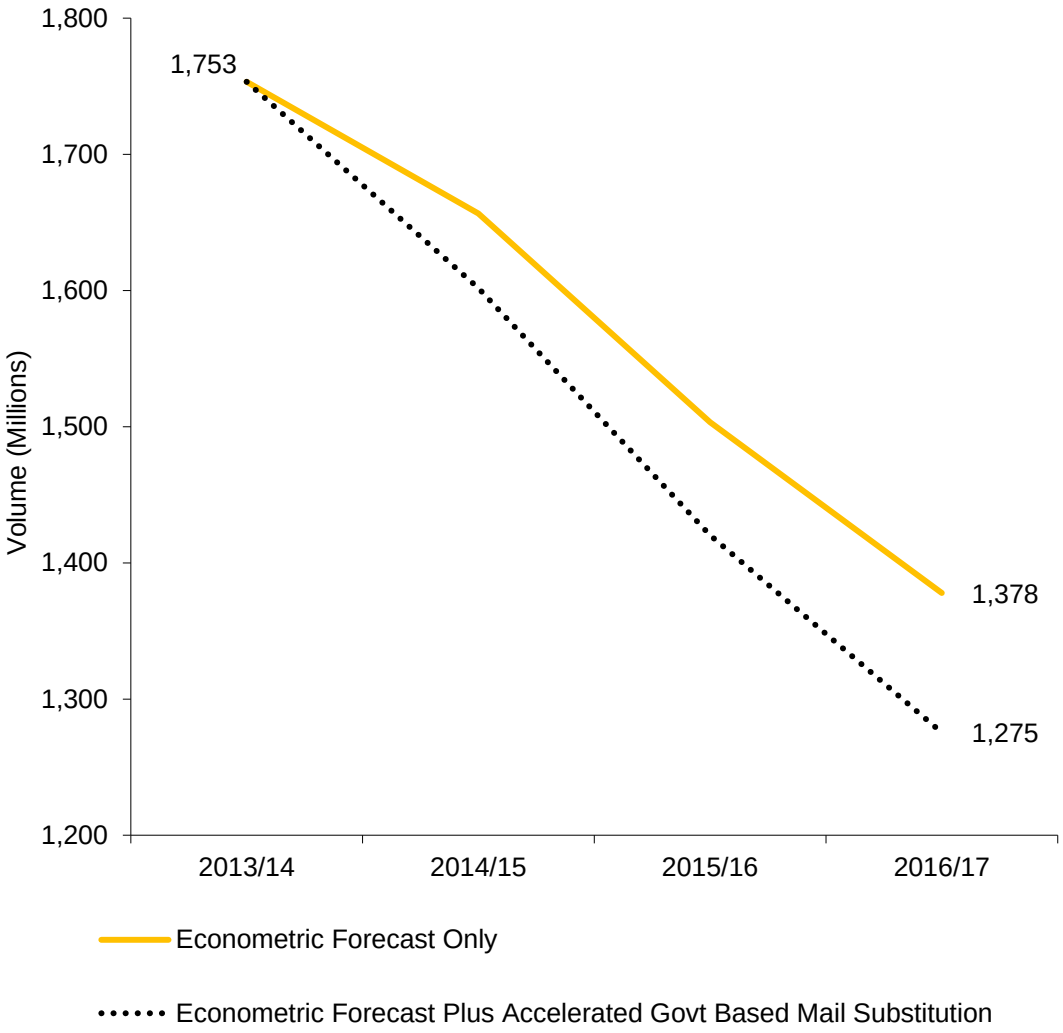
[38] SMS letter alert messages have been sent to Centrelink, Medicare and Child Support customers directly increasing awareness about the portal.

[39] Source: www.malcolmturnbull.com.au

Whilst this scenario is intended for illustrative purposes only it may represent a conservative estimate of the resultant substitutive effects on total PreSort small letter volumes should any existing government portal extend its scope into the realm of private industry.

Chart 4.4.1 Potential Impact of a 25%p.a. Digitisation of Public Administration and Safety PreSort Small Letter Volumes



4.4.2 Financial and Insurance Services

Financial institutions are engaging in cost cutting activities in addition to the adoption of purported 'environmentally friendly' strategies.[40]

Examples indicative of a declining reliance on paper-based modes of communications within financial sector include:

- ANZ reduced their paper usage for customer correspondence by 5% in 2014, 18% in 2013 and by 6% in 2012.[41]

- Westpac's total Australian paper consumption has decreased by 7% in 2014, 5% in 2013, 4% in 2012 and by 8% in 2011.[42]

- The Commonwealth Bank of Australia (CBA) has promoted the use of paperless statements since January 2008. More than 1.5 million CBA customers with deposit accounts and over 400,000 with credit card accounts made the switch to online statements over the 2008 to 2010 period. This figure is projected to be significantly higher as at 2015;

- MECU Limited's volume of hard copy letters sent to customers (961,500) declined by 23 per cent between 2010/11 and 2011/12. The decrease in paper sent to customers is directly attributed to more customers subscribing to electronic statements and receiving their statements via internet banking. However, hard copy statements sent to customers (1,972,799) increased by 4 per cent from 2011/12 to 2010/11 due to organic customer volume growth.

Financial institutions are likely to continue with their paper saving strategies moving forward and it is likely that historical trends will prevail in the medium to short term.

The impact on PreSort small letter volumes is not be expected to deviate significantly from recent trends within this sector over the forecast horizon in the absence of a wide reaching online presentment portal.

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[40] Electronic channels acting as an environmentally friendly alternative to the physical letter is a moot point. However, what is not in dispute are senders who might at times attempt to stream recipients towards an electronic alternative by promoting supposed environmental benefits irrespective of the validity of the statements espoused.

[41] Source: www.anz.com.au

[42] Westpac Group Annual Review and Sustainability Report 2014, www.westpac.com.au

4.4.3 Communications

Firms within the Telecommunications industry are characterised by similar market characteristics to financial institutions.

They too have tended to increasingly engage in paper usage reduction strategies and the deployment of financial inducements to stream customers towards receiving online bills.

Examples of these activities include:

- At Telstra the paper volumes used for producing their customers' bills have decreased annually by 15% in both FY14 and FY13. They attribute this to an increased volume of consumers opting to receive their bills online.[43]

- The Optus' customer base increasingly continues to opt-in to online bill presentment. Prior to 2012/13, online billing was restricted to 75% of Optus consumer customers. Subsequently it has become available to every Optus consumer customer. As at 2014, 48% of Optus customers received their bills exclusively online (compared to 44% in 2013).[44]

Similar online adoption growth to that experienced in recent years could reasonably be expected over the forecast horizon for firms within the telecommunications industry.

The impact on PreSort small letter volumes is expected to follow recent trends in the absence of a wide reaching online presentment portal.

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[43] Source: www.telstra.com.au

[44] Source: www.optus.com.au

5. OTHER LARGE LETTERS

5.1 BACKGROUND

The 'Other' (Ordinary) large letter segment consists of full rate mail up to a maximum size, weight and thickness of 360x260mm, 500g, and 20mm respectively.[45]

In this segment volumes are hypothesised to predominantly consist of individual non-standard sized household-to-business, business-to-business and business-to-household mailings, traditionally considered an effective channel for larger document transmission.

The Other (Ordinary) large letter became one of the first segments to be impacted by the forces of electronic substitution in the 1990's as email emerged as a cost effective alternative when exchanging large documents.

As internet penetration became increasingly ubiquitous so too did the development of websites that enabled online form completion.

These factors had resulted in a substantial amount of electronic substitution throughout the 1990's consistently pushing Other (Ordinary) large letter volumes downwards.

However, the segment rebounded over the 2000/01 to 2007/08 period registering an average annual increase of 1.0 %.

With many of the Other (Ordinary) large letter volume substitution having already occurred earlier the segment then reverted back to correlating more highly with movements in the domestic level of economic activity.

As with most letter segments though the global financial crisis of 2007/08 acted as a catalyst for a new era of decline.

A wave of new technological developments again accelerated the movement away from the Other (Ordinary) large letter item and in the period 2007/08 to 2012/13 the average annual volume decline registered -6.5%.

Despite facilitating widespread and sustained substitution of non-standard sized documentation, email was still plagued with some restrictive factors such as limits on the size of the files being transmitted.

Since 2007/08 however, the increasing popularity of cloud storage facilities and flash drives has again provided senders with a greater scope and flexibility of alternatives when dealing with the exchange of larger documents.

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[45] Examples of which is the rectangular B4 & C4 envelope sizes.

The growth in fixed-line broadband technology is a suitable proxy for capturing the substitutive and behavioural change consequences impacting the Other (Ordinary) large letter volume segment over the very recent past.

Unlike bulk small letter bill presentments though the emergence of a new platform that results in the next wave of large letter volume substitution is not apparently obvious.

Therefore, fixed-line broadband growth rather than its mobile wireless counterpart has been employed as an appropriate proxy of the recent movements away from the Other (Ordinary) large letter volume segment.

Presented in Table 5.1.1 are the annual percentage growth rates since the year 2000/01 for each of the Other (Ordinary) Large Letter volume hypothesised drivers.

Table 5.1.1 Percentage Changes
Other (Ordinary) Large Letter Volumes and Hypothesised Drivers

	Sep 2013 to Sep 2014 % Change	Average Annual % Change	
		2000/01 to 2007/08	2007/08 to 2012/13
Other (Ordinary) Large Letter Volumes	-6.68%	1.04%	-6.52%
Domestic Broadband Index	1.89%	59.47%*	16.47%
Real Price of Other (Ordinary) Large Letters	14.04%	-2.91%	1.76%
Estimated Australian Population	N/A	1.40%	1.71%
Australian Non-farm GDP	2.65%	3.63%	2.41%
GDP Sub Segments:			
• **Information Media and Telecommunications Industry**	3.99%	4.75%	1.19%
• **Finance and Insurance Services Industry**	4.61%	6.79%	1.79%
• **Public Administration and Safety Industry**	2.93%	2.48%	2.71%
• **Health Care and Social Assistance Industry**	4.93%	4.76%	4.29%
• **Education & Training Industry**	2.56%	1.93%	1.96%

* The average annual growth rate for this variable is calculated from 2002/03 due to data availabilities.

5.2 ELASTICITY ESTIMATES

5.2.1 Overview

The methodological approach to constructing the Other (Ordinary) large letter volume vector error correction model is outlined in Appendix A of this document (Appendix C.1 contains the associated statistical output).

The Other (Ordinary) large letter model explains 92.3% of the total quarterly variation in Other (Ordinary) large letter volumes over the March 2008 to September 2014 timeframe.

5.2.2 Long Run Market-based Volume Drivers & Elasticity Estimates

Presented below are the historical demand drivers together with the relevant demand elasticity.

1. **Real Gross Domestic Product (Non-farm):**

Increases in the level of economic activity over the examined time frame were significantly associated with growth in Other (Ordinary) large letter volumes.

Elasticity: A 1% increase in Real GDP (Non-farm) was associated with a 0.35% increase in Other (Ordinary) large letter volumes on average in the long-run.

Recent Trend: Real GDP (Non-farm) has been growing at an annual average rate of 3.1% from 2000/01 to 2012/13 and by 2.7% in the 12 months prior to September 30, 2014.

2. **Real price:**

The real cost (i.e. price adjusted for inflationary effects) of sending Other (Ordinary) large letter mail is inversely related to demand. Price changes in the examined time frame have been significantly associated with demand responses in the contrary direction.

Elasticity: A 1% increase in the real price of sending Other (Ordinary) large letters was associated with a 0.78% decrease in Other (Ordinary) Large Letter volumes on average in the long-run.

This estimated Other (Ordinary) Large Letter price elasticity is significantly greater than that of the remaining letter volume segments.

This could be a result of a mis-specified proxy for electronic substitution within the modelling framework for this segment.

There are difficulties in specifying a precise measure of electronic substitution for this letter volume category which largely consists of a broad range of non-descript ad-hoc mailings.

Any interpretations of this price elasticity should therefore be treated with all due caution.

Recent Trend: The real price of an Other (Ordinary) large letter decreased at an annual average rate of 2.2% between 2000/01 to 2007/08 and increased by 14.0% in the 12 months prior to September 30, 2014.

3. **Electronic document substitution through domestic fixed line broadband growth:**

As the number of broadband connections and EDI technology has increased substantially in recent years, electronic documentation such as PDF file formats have become viable alternatives to the sending of communications through regular business mail channels.

As such, variations in letter volumes are explained to a statistically significant degree via the inverse association that Other (Ordinary) large letter volumes have with the levels of growth in the fixed-line broadband index.

Elasticity: A 1% increase in the fixed-line broadband index was associated with a 0.2% decrease in Other (Ordinary) large letter volumes on average in the long-run.

Recent Trend: Recent fixed line broadband connections have been growing at an annual average rate of 36.3% between 2002/03 and 2011/12, this figure has slowed to 1.9% growth in the 12 months prior to September 30, 2014.

5.3 BASELINE FORECASTS

5.3.1 Preamble

The statistically significant Other (Ordinary) large letter volume drivers over the 2008 Q1 to 2014 Q3 timeframe are:

- **Substitution:** In the Other (Ordinary) large letter model, substitution is captured by the fixed-line broadband variable as being representative of the growth in EDI technology, email transmission of larger documents and the proliferation of online form facilities;

- **Domestic Non-farm Real GDP:** Other (Ordinary) large letter volumes are positively associated with movements in the general health of the economy; &

- **Price:** A combination of inflationary real price declines and nominal price increases.

5.3.2 Driver Projections Utilised

A series of projected values on each of the relevant drivers within the VECM framework are required for forecasting and these include:

- CPI projections resulting in real price changes of -2.5% per annum over the 2014/15 to 2016/17 period are given by the Commonwealth Budget and have been utilised as proxies for the inflationary rate of change contained within the real price projections.

- Nominal price increases as provided by Australia Post. The contingencies examined do not account for any changes in demand resulting from an alteration in Australia Posts required Other (Ordinary) large letter delivery service standards. Nor do the scenarios illustrate any possible cross segment volume migration that could be expected from the introduction of the Regular and Priority timetables.

- To ensure the measure of electronic substitution within this segment adequately reflects the emergence of alternative channels the broadband variable transitions from fixed-line to mobile for the forecast timeframe. Projections on this growth rate are set to 18% per quarter to reflect the recent growth in a number of variables including the growth in mobile data traffic in the Asia Pacific region.[46]

- The annual GDP growth rate projections utilised are 2.5% in 2014/15, 3.0% in 2015/16 and 3.5% for the 2016/17 financial years as given by the Commonwealth Budget.

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[46] Cisco (2012), "*Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update", 2011–2016,* Asia Pacific Mobile Data Traffic, p.24

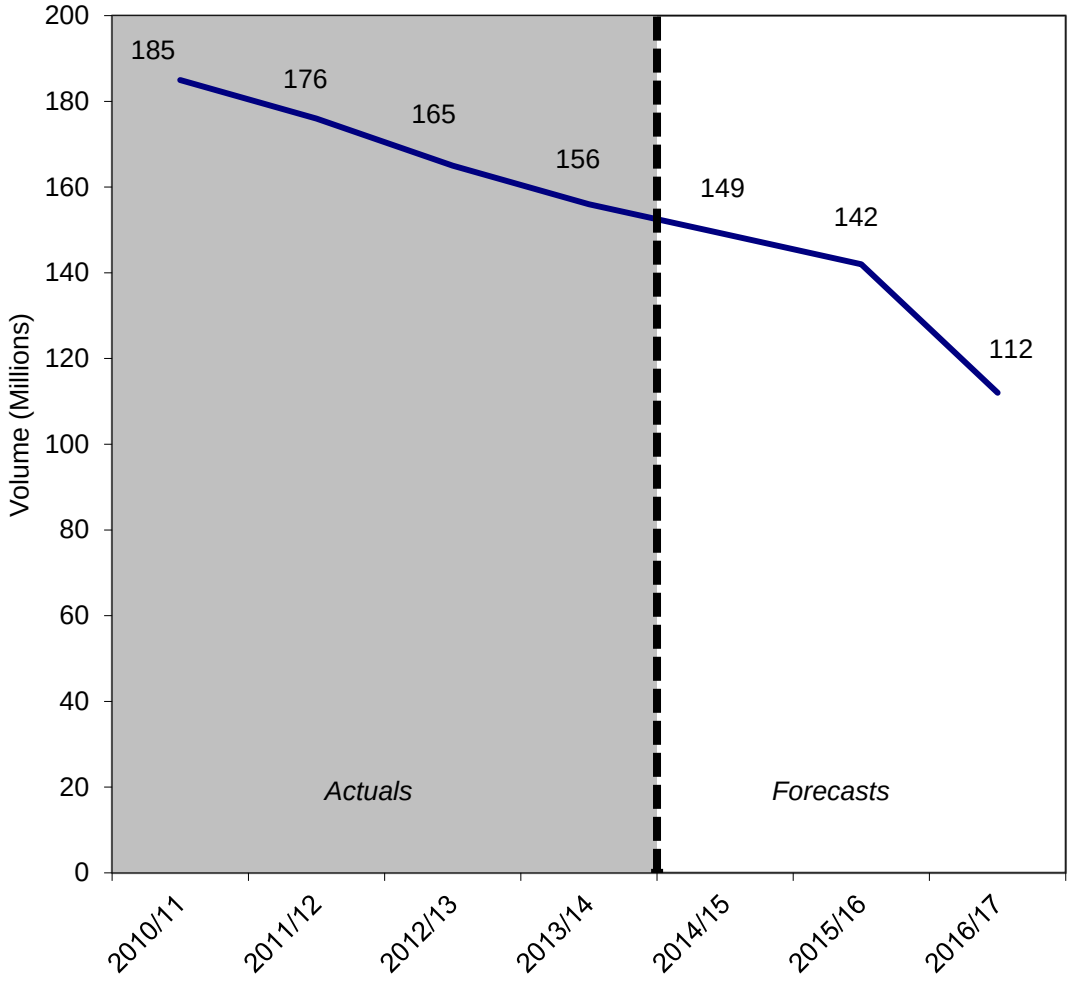
5.3.3 Econometric Baseline Volume Projections

Other (Ordinary) Large Letter *ex-ante* baseline forecasts are presented in Table 5.3.3.1 and Chart 5.3.3.1 in this Section.

Table 5.3.3.1 Other (Ordinary) Large Letter Volumes
Econometric Forecast Percentage Changes

	Forecast Volume Decline
2014/15	-4.80%
2015/16	-4.44%
2016/17	-21.19%

Chart 5.3.3.1 Other (Ordinary) Large Letter Volumes
Historical & Forecast



6. PRESORT LARGE LETTERS

6.1 BACKGROUND

The 'PreSort' large letter volume segment consists of bulk (300+) lodgements of large letter mail that satisfies the relevant large letter category size and weight requirements.

Volumes in this segment are assumed to consist of bulk non-standard sized letter items emanating from business and the public sector that may represent prospectuses, annual reports, promotional material, etc.

The nature of these bulk mail items suggested a strong dependence upon business activity and a consistently strong Australian economy resulted in an average annual growth in PreSort large letter volumes of 2.3% over the 2000/01 to 2007/08 period.

In addition to the general effects associated with the global financial crisis of 2008 other factors have also altered the landscape for the PreSort large letter volume segment in recent times.

One of the primary instances of electronic substitution on this segment manifested itself in the form of the Corporations Legislation Amendment (Simpler Regulatory System) Act 2007.

This legislative change had a significant negative impact on the volume of company annual reports mailed directly to eligible members that were previously sent via the PreSort large letter service.

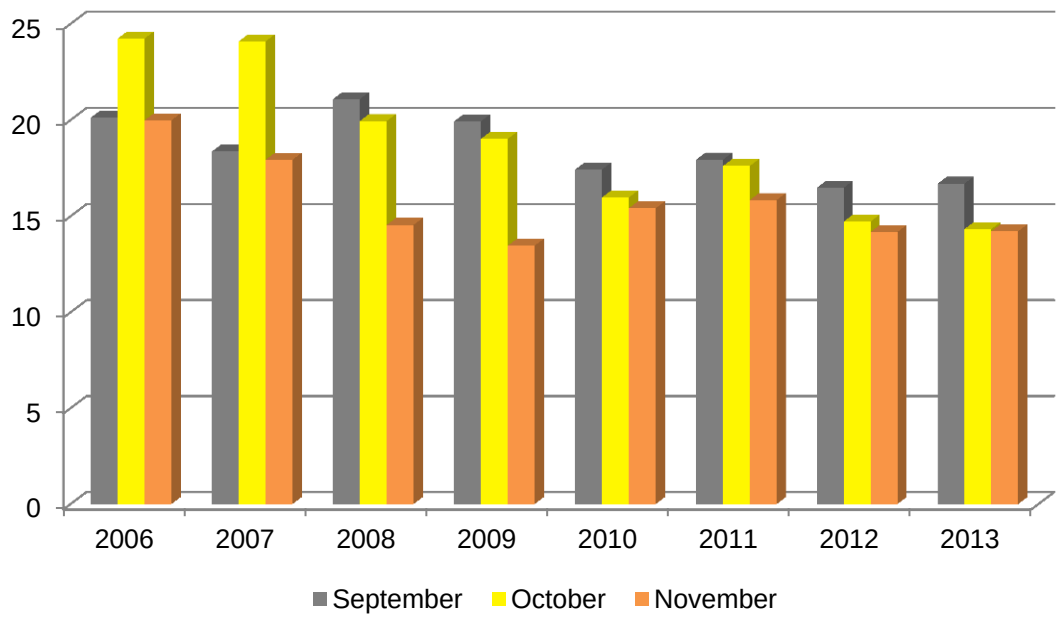
The change in the Act compelled companies to mail a hard copy of annual financial reports to eligible members on an opt-in basis. This resulted in lower volumes of company annual report mailings and reduced an important component within the mix of PreSort large letter volumes.

As Chart 6.1.1 illustrates PreSort large letter volumes across the peak period have reduced since the introduction of the Corporations Legislation Amendment (Simpler Regulatory System) Act 2007.

A number of hypothesised PreSort large letter volume driver annual percentage changes since 2000/01 are presented in Table 6.1.1 .

Over the most recent twelve month period a rebound in the levels of discretionary spend associated with the health in the Australian Advertising industry has resulted in PreSort large letter volume declines less severe than in each of the other key segments considered in this study.

Chart 6.1.1 PreSort Large Letter Volumes in the Annual Report Months



In contrast however, the general trend in a number of other theoretical drivers of PreSort large letter volumes have recently moved in a direction that would tend to impede further volume growth in this category.

When comparing the most recent twelve months to the pre 2007/08 period a number of variables in Table 6.1.1 illustrates this point as there has been:

- An increase in the price of paper as a direct input for promotional activities using mail;
- An increase in the real price of a PreSort large letter item;
- A level of economic activity that remains below pre 2007/08 levels; and
- A continuation of electronic substitution effects as mentioned earlier.

Table 6.1.1 Percentage Changes
PreSort Large Letter Volumes & Hypothesised Drivers

	Sep 2013 to Sep 2014 % Change	Average Annual % Change	
		2000/01 to 2007/08	2007/08 to 2012/13
PreSort Large Letter Volumes	-1.84%	2.25%	-5.64%
Advertising Industry Health Measure	6.83%	-4.28%	-3.53%
Real Price of PreSort Large Letters	4.75%	-2.91%	-0.62%
Paper as an Input Cost for Direct Mail	1.70%	-0.07%	0.44%
Estimated Australian Population	-	1.40%	1.71%
Australian Non-farm GDP	2.65%	3.63%	2.41%
GDP Industry Sub Segments:			
• **Information Media and Telecommunications**	3.99%	4.75%	1.19%
• **Finance and Insurance Services**	4.61%	6.79%	1.79%
• **Public Administration and Safety**	2.93%	2.48%	2.71%
• **Retail Trade**	2.01%	5.01%	2.08%

* The average annual growth rate for this variable is calculated from 2002/03 due to data availabilities.

6.2 ELASTICITY ESTIMATES

6.2.1 Overview

The methodological approach to constructing the PreSort large letter volume vector error correction model is outlined in Appendix A of this document (Appendix C.1 contains the associated statistical output).

The PreSort large letter model explains 76.6% of the total quarterly variation in PreSort large letter volumes over the March 2008 to September 2014 timeframe.

6.2.2 Long Run Market-based Volume Drivers & Elasticity Estimates[47]

Presented below are the historical demand drivers together with the relevant demand elasticity:

1. **The health of the advertising industry:**

The health of the advertising industry continues to be a major explainer of PreSort large letter volumes due to the promotional characteristics of some volumes within this category

Elasticity: A 1% increase in the consumer discretionary index (i.e. the measure of health of the advertising industry) was associated with a 1.2% increase in PreSort large letter volumes on average in the long-run.

Recent Trend: The consumer discretionary index has fluctuated considerably since the start of 2000/01. Overall however, the index has increased by 4.0% in the 12 months prior to September 30, 2014 despite decreasing at an annual average rate of 6.8% between 2000/01 and 2012/13.

2. **Electronic bulk large documentation substitution via mobile broadband growth:**

Substitutive pressures on PreSort large letter volumes have intensified following the institution of the Corporations Amendments Act of 2007 which encouraged migration across to online alternatives to the PreSort large letter.

This has combined with an increase in the ability of senders to transmit bulk produced documentation via electronic alternatives such as email and web portals.

[47] The real price of PreSort large letter volumes did not register any statistical significance and hence volumes for this segment are assumed to be perfectly price inelastic.

Growth in wireless mobile broadband penetration levels are used to proxy these structural change effects.

Elasticity: A 1% increase in wireless mobile broadband connections was associated with a 0.15% decrease in PreSort Small Letter volumes on average in the long-run.

Recent Trend: Mobile broadband traffic in the Asia Pacific is projected to have grown by 112.8% over the 2012/13 financial year.

3. **Initial public offerings (IPO's):**

Large scale IPO's have positively impacted PreSort large letter volumes over the examined timeframe.

Associated prospectus' mail-outs tend to have 3-4 weeks lead time into the public offering date.

Elasticity: A 1% increase in volumes accompanying large IPO's was associated with a 0.01% increase in PreSort Large Letter volumes on average in the long-run.

Annual report dissemination (Seasonal):

Whilst, the seasonal nature of annual report dissemination eliminates it from the feasible set of drivers, *per se*, it should be noted that bulk mail-outs of annual reports occur in the month of October as a result of the legislative requirement for most publicly listed companies to lodge by September 30 of each year.

PreSort large letter volumes in the December quarter are typically 19% higher than the quarterly average due to the proliferation of annual report type mail.

6.3 BASELINE FORECASTS

6.3.1 Preamble

The PreSort Large Letter volume drivers over the 2008 Q1 to 2014 Q3 timeframe are:

- **The health of the advertising industry:** Non-standard sized direct mail is assumed to constitute an important part of marketers' overall promotional alternatives;

- **Substitution:** Mobile wireless broadband traffic is employed as a proxy for the increasing popularity of alternative electronic channels that allow for the receipt and evaluation of non-standard sized bulk documents. This variable also intends on capturing the impacts that have arisen since the relaxation on listed companies in sending annual reports via a traditional large letter service; &

- **Initial Public Offerings:** Large amounts of PreSort large letter volumes consisting of prospectus and associated bulk documentation have tended to be associated with the lead in to large IPO's listing dates.

6.3.2 Driver Projections Utilised

A series of projected values on each of the relevant drivers within the VECM framework are required for forecasting and these include:

- The projections on the consumer discretionary index growth rate are set to zero for the projection years of 2014/15 to 2016/17 due to the volatile nature of variations in this variable and in the presence of no recognised institutional forecasts on the state of the advertising industry in future years.

- The wireless mobile broadband traffic growth rate is set to the anticipated quarterly growth rate derived utilising projections on global mobile traffic in the Asian Pacific region of 78.9% in 2014/15, 71.6% in 2015/16 and 75.5% in 2016/17.

- Due to the uncertain nature of future public offerings and associated market capitalisations beyond a very short time horizon projections on IPO's over the forecast horizon are set at zero. Future IPO's should be monitored to facilitate the incorporation of associated impacts upon the existing ex-ante forecasts.

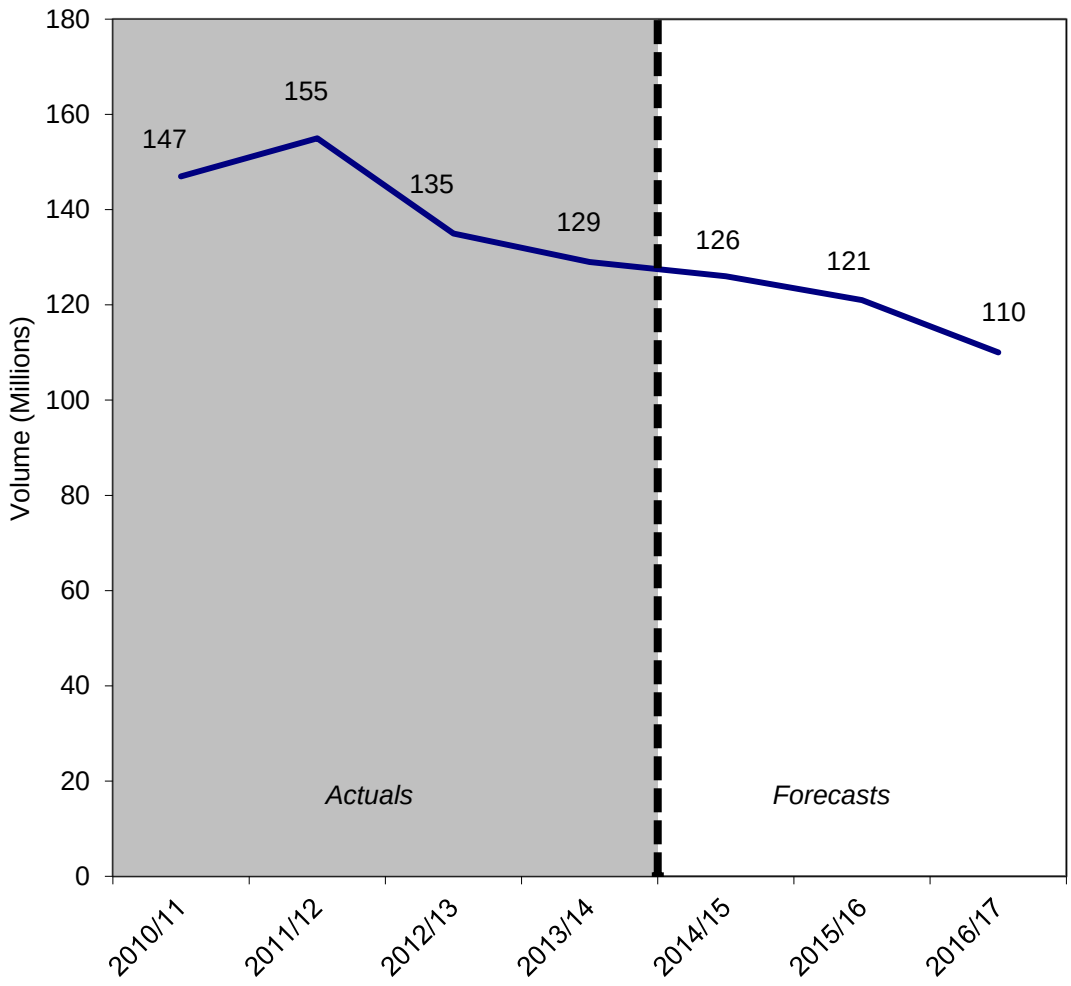
6.3.3 Econometric Baseline Volume Projections

The PreSort large letter *ex-ante* baseline forecasts are presented in Table 6.3.3.1 and Chart 6.3.3.1 in this section.

Table 6.3.3.1 PreSort Large Letter Volumes
Econometric Forecast Percentage Changes

	Forecast Volume Decline
2014/15	-2.4%
2015/16	-3.9%
2016/17	-9.3%

Chart 6.3.3.1 PreSort Large Letter Volumes
Historical & Forecast



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APPENDIX A

ECONOMETRIC PROCESS

The econometric analysis presented in this Appendix represents the culmination of over 15 years of modelling letter volumes by Diversified Specifics on behalf of Australia Post.

During this period Diversified Specifics has identified a number of key letter volume drivers which have been utilised to construct various scenarios as regards real price variations; the effects of the macroeconomy (especially during the global financial crises beginning in 2007/08); and the role of electronic substitution in framing the current postal landscape.

The core econometric methodology is premised on specifying a dynamic model that allows for both long-run and short-run movements combined with their interaction effects on letter volumes.

Formally this modelling framework represents a vector error correction model, or VECM, which explicitly models the dynamic trends within letter volumes and their key drivers while the long-run and short-run interactive effects are captured by error-correction components.

The VECM is a special case of a slightly more general dynamic model known as a vector autoregression, or VAR, as it imposes a set of cross-equation restrictions on the parameters of the VAR caused by the long-run component of the model impacting upon all of the variables within the dynamic system.

In implementing the dynamic VECM for each letter segment the following econometric methodological framework is followed:

1. The identification of a broad array of letter volume drivers capturing key components of demand including real prices, income effects, electronic substitution, the economic environment and general components that impact upon volumes overall. These variables are initially tested which, in turn, are synthesised into a more narrowly defined group of drivers to derive a parsimonious modelling of segmented letter volumes.

2. An important set of variables investigated relate to those attempting to quantify the effects of electronic substitution. These variables are inherently difficult to measure as the factors affecting the substitution between letter volumes and the emergence of new technologies for transmitting information are extremely broad. Indeed, variables availability is often very limited. There is also the added dimension that the technological landscape, their penetration rates and the manner in which technological change impacts letter volumes is continually evolving. For all of these reasons identifying variables and constructing a consistent series to measure substitution provides additional challenges.

3. In determining the long-run drivers of letter volumes, an exhaustive set of unit root tests are conducted to classify variables in terms of their stochastic trend behaviour.

4. Related to the determination of the stochastic trend properties of the key variables in the model, tests for structural breaks are performed. This permits an identification of the dramatic changes in segmented letter volumes investigated over the last 20 years caused by external shocks to the Australian economy as well as the more recent substitutive effects on letter volumes arising from the emergence of new technologies. The outcomes of these tests when applied to each letter segment are used to identify the choice of estimation periods and whether the VECMS require augmentation directly to account for structural change effects not captured directly by the drivers of the specified models.

5. The dynamics of the VECM are formally tested using various information criteria based on methods given by Akaike, Hannan-Quinn and Schwarz. In implementing these tests the lag length criteria are based on the VAR which is appropriate as the dynamics are determined before the identification of the long-run properties of the model.

6. The next phase of the econometric analysis involves establishing the presence of a long-run relationship amongst the drivers. As the drivers are identified to be integrated processes based on the unit root tests, the establishment of a long-run relationship is equivalent to testing for cointegration amongst all the drivers within each segment. The cointegration tests are based on the tests proposed by Johansen (1995) which is appropriate for the VECM framework adopted here as these tests represent a multivariate test of cointegration that are applied to a sequence of VECM specifications beginning with the unrestricted VAR model. In choosing these subset specifications, an allowance for intercepts in both long-run and short-run specifications is allowed for maximum flexibility.

7. Having established the presence of a long-run cointegrating equation the VECM is then estimated to derive point estimates of the long-run and short-run parameters, including the estimates of the error-correction parameters which control the dynamic equilibrium properties of the model.

8. For certain letter segments the VECM is refined in terms of variable selection as a result of the economic and statistical significance of parameter estimates as well as whether the parameter estimates conform to economic theory as determined from standard demand theory. For some of the segments where degrees of freedom issues may be an issue, dynamic cointegrating single equation methodologies are also investigated.

9. A range of diagnostic tests are applied to each estimated VECM. These include within sample goodness of fit tests; tests for weak and strong exogeneity; and tests applied to the VECM residuals.

10. The final stage of the econometric analysis involves undertaking various scenario tests to forecast future trends in letter volumes for each segment. The scenarios are based on a combination of the historical trends identified in the variables of the VECM together with assumed future patterns that the drivers may follow. These future patterns are based on proposed future price changes given by Australia Post and projections obtained from Federal budget forecasts. Some of the driver sensitivity analyses are also performed as regards the electronic substitution variables, etc.

Whilst the econometric methodology is common across all four letter volume segments investigated by Diversified Specifics, nonetheless there are some specific features that are idiosyncratic to modelling each letter volume segment which require additional refinements.

These may include the choice of variables, final model specifications, sample periods etc. Some of these issues are discussed below with details of the estimated specifications governing all econometric models and test statistic tables contained within Appendix C of this document.

Structural Break Testing

Each of the letter volume segments were tested individually for a structural break in the presence of a unit root. The objective of such tests was to assist in the determination of a timeframe that would best reflect recent movements in small and large letter volumes.

For each segment outliers in volumes occurring in 1998/99 and 2001/02 punctuate the letter volume data as a result of Australia Post altering the rules governing lodgement minimums for PreSort bulk mail.

The associated volume spikes and troughs reflect cross-segment letter volume migration, not an underlying market trend or to be considered a genuine structural break in any of the series.

- **Other (Ordinary) Small**

Where the substitutive landscape had largely held constant over an extended period of time, such as the case for Other (Ordinary) small letter volumes then any intelligence on the existence of a structural break was balanced against the desire to obtain a set of parameter estimates that sought to maximise the available degrees of freedom.

This process suggested aligning the first observation for the VECM with the commencement date of the data associated with the variable used to proxy the substitution of bill payments away from the traditional letter item (2002 Q1).

Testing the series from 2002 Q1 onwards for a unit root with a structural break highlights the series is characterised by a structural break in 2007/08.

An important feature of the time series patterns of Other (Ordinary) small letter volumes over the entire period investigated is that it exhibits a general downward trend from 2002 to 2014.

This is in stark contrast to time series patterns of the remaining three letter volume segments investigated within this research undertaking which all show a reversal of their trend behaviour at the time of the financial crisis in 2007/08.

These properties suggest that the global financial crisis had a relatively more pervasive and fundamental impact upon these remaining letter volume segments than it did on the Other (Ordinary) small letter volume category.

This is especially the case given that similar extreme patterns do not appear within the drivers of these other models. In contrast the effect of the financial crisis on Other letter volumes was to accelerate the decline in volumes which had already commenced several years prior to the time of the crisis.

These results taken together suggest that the effects of the financial crisis on the Other (Ordinary) small letter volume segment can potentially be captured either by the changes in the key drivers of this segment, and or, through the augmentation of the model using shift variables to capture the crisis.

An important advantage of estimating the model for Other (Ordinary) small letter volumes over a relatively longer period is that the additional information obtained from having a longer sample can improve the precision of the parameter estimates resulting in smaller standard errors and statistically significant estimates with greater efficacy, provided that the restrictions imposed on the model's structure for the larger period are indeed not violated.

To gain some insight into the effects of different sample sizes on the parameter estimates a sensitivity analysis was conducted regarding the choice of the commencement of the sample.

The results of estimating the truncated VECM are given in Table A.1 and are contrasted to the preferred 2002 Q1 to 2008 Q1 Other (Ordinary) small letter volume model presented in Table C.1.1 in Appendix C.

Table A.1 Truncated Other (Ordinary) Small Letter Volume VECM

Vector Error Correction Estimates
Date: 03/17/15 Time: 16:01
Sample: 2008Q1 2014Q3
Included observations: 27
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LNSADJOT(-1)	1.000000
LNSADJCH(-1)	-0.552364
	(0.02017)
	[-27.3911]
LNREALPR(-1)	0.141139
	(0.13741)
	[1.02715]
C	0.414417

Error Correction:	D(LNSADJOT)	D(LNSADJCH)	D(LNREALPR)
CointEq1	-0.776003	-0.061256	0.021686
	(0.17256)	(0.16377)	(0.32501)
	[-4.49692]	[-0.37404]	[0.06672]
C	-0.019325	-0.033827	0.005890
	(0.00383)	(0.00364)	(0.00721)
	[-5.04497]	[-9.30502]	[0.81638]
R-squared	0.447175	0.005565	0.000178
Adj. R-squared	0.425062	-0.034212	-0.039815
Sum sq. resids	0.009905	0.008921	0.035134
S.E. equation	0.019904	0.018890	0.037488
F-statistic	20.22228	0.139909	0.004452
Log likelihood	68.48165	69.89438	51.38838
Akaike AIC	-4.924566	-5.029213	-3.658398
Schwarz SC	-4.828579	-4.933225	-3.562411
Mean dependent	-0.019325	-0.033827	0.005890
S.D. dependent	0.026251	0.018575	0.036763

Determinant resid covariance (dof adj.)	1.79E-10
Determinant resid covariance	1.42E-10
Log likelihood	191.1940
Akaike information criterion	-13.49585
Schwarz criterion	-13.06390

A comparison of the results reveals a set of common long-run point estimates that have similar signs.

The value of the parameter on the substitution proxy, cheque volumes is very similar to the estimate obtained using the larger sample beginning in 2002 Q1.

The real price elasticity is slightly smaller in magnitude and statistically insignificant at conventional significance levels.

To determine whether the effects of the financial crisis on Other (Ordinary) small letter volumes could be captured through the drivers of the model, inspection of the residuals of the estimated model over the full sample period did not reveal any evidence of the crisis on volumes not captured by the model.

Some further tests on the ability of the estimated VECM over the full sample to capture the effects of the crisis were conducted by re-estimating the model by including a shift variable for the crisis.

The long-run parameter estimate on the substitution variable LNSADJCH was characterised by a marginal change whilst there was a very small alteration in the long-run real price elasticity that did not represent any significant statistical variation.

Also the statistical strength of these two long-run parameter estimates were qualitatively similar to the model without the crisis-shift variable.

These results are also supported by the statistical results that highlight the crisis-shift variable was found to be statistically insignificant in all equations of the VECM.

- **PreSort Small**

The first step in choosing an appropriate timeframe for PreSort small letter volumes is to acknowledge data on the lead proxy for bill presentments type substitution, fixed-line broadband commences at 2002 Q1.

Furthermore a plot of PreSort small letter volumes (as in Chart 2.1.1) highlights two dominant time periods, each with its own discernible trend.

The period between 1995/96 and 2007/08 is characterised by a strong upward trend that is largely driven by a rapid increase in bill presentment type bulk mailings.

The second period commences with the onset of the global recession of 2007/08 with PreSort small letter volumes thereafter following a relatively consistent downward trend.

Given the clear distinction between the two time periods unit root testing on logarithmic volumes (seasonally adjusted) with a structural break highlights a structural break at the end of 2007.

For this reason the commencement date for the sample period that ultimately determines the preferred estimate of the VECM for PreSort small letter volumes is 2008 Q1.

The empirical effects of the financial crisis for this letter segment were in stark contrast with those identified for Other (Ordinary) small letter volumes where the effects of the crisis on PreSort small letter volumes were found to be far more pervasive resulting in fundamental changes in the VECM from 2007/08 onwards.

Within the Other (Ordinary) small letter volume segment there were no abrupt changes in the trend at the time of the crisis with deviations in the drivers of this model adequately able to capture the effects of the crisis on volumes in this segment.

- **Other (Ordinary) Large**

Prior to any form of evaluation, a smoothing adjustment was employed to Other (Ordinary) large letter volumes to counter an Australia Post data recording issue towards the end of the sample.

This adjustment was undertaken in the form of a dichotomous variable which was also included as an exogenous variable aimed at isolating the volume impacts and constructed to commence at 2014 Q1 and conclude at 2014 Q2.

When determining the sample period for econometric testing the feasible set of observations commenced in 2002 Q1 to coincide with the initial date of data collection for the electronic documentation substitution lead proxy, fixed-line broadband.

Applying a unit root test for a structural break to Other (Ordinary) large letter volumes from 2002 Q1 and beyond implies the presence of a structural break beginning in 2007/08.

This information combined with a clear Other (Ordinary) large letter volume trend change from 2008 onwards (See Chart 2.1.2) led to the selection of 2008 Q1 as an appropriate commencement date for econometric testing.

This choice of sample period follows the exact same approach as was adopted for modelling Presort small letter volumes.

Both letter segments exhibited very similar time series behaviour as regards trend evolution suggesting that the effects of structural change arising from the financial crisis were qualitatively similar for the two letter segments, but clearly not for the case of the Other (Ordinary) small letter volume category.

- **PreSort Large**

In testing for the presence of structural breaks for PreSort large letter volumes, in contrast to the remaining letter volume series two structural breaks were observed, the first occurring in 2000/01 and the second 2007/08.

Formally the detection of multiple breaks is achieved by applying the unit root tests for structural breaks to the entire data and identifying the first break. This break is removed from the sample and the structural break test reapplied to the remaining portion of the sample.

The first structural break coincides with the volume demand increase that was a consequence of Australia Post changing the lodgement requirements for its PreSort letter service.

The second structural break occurs at the beginning of the global financial crisis which was also detected in the structural break tests conducted in the remaining segments.

A comparison of the time series properties of PreSort small and Other (Ordinary) large letter volumes with PreSort large letter volumes highlights all three volume segments were qualitatively effected by the financial crisis in a similar manner.

Following a similar strategy as for PreSort small and Other (Ordinary) large letter volumes, the commencement date in estimating the VECM for PreSort large letter volumes was chosen to be the first quarter of 2008.

Estimating the VECM

In modelling each of the small and large letter volumes individually using a Vector Error Correction Model (VECM) framework, a VAR is initially estimated to generate the preliminary estimate of the lag structure.

This approach is premised on the property that a VECM is a restricted form of a VAR whereby if the lag structure of a VAR is of order P then the lag structure of the VECM is P-1.

A range of preliminary tests were conducted on a broad set of potential drivers of letters volumes corresponding to each segment. Combining these statistical results with a-priori knowledge from previous studies on letter volume demand yielded the following set of variables in the VAR of each segment:

Other (Ordinary) Small

1. Other (Ordinary) Small Letter Volumes
2. Cheque Volumes as a proxy for Bill Payment Substitution
3. The Real Price Index of Other (Ordinary) Small Letter Volumes

PreSort Small

1. PreSort Small Letter Volumes
2. The Real Price Index of PreSort Small Letter Volumes
3. The Health of the Advertising Industry
4. Mobile Broadband growth as a proxy for Bill Presentment Substitution

Other (Ordinary) Large

1. Other (Ordinary) Large Letter Volumes
2. Non-Farm Gross Domestic Product (GDP)
3. The Real Price Index of Other (Ordinary) Large Letter Volumes
4. Fixed-line Broadband as a proxy for Electronic Document Transmission Substitution

PreSort Large

1. PreSort Large Letter Volumes
2. The Real Price Index of PreSort Large Letter Volumes
3. The Health of the Advertising Industry
4. Mobile Broadband growth as a proxy for Bulk Electronic Document Transmission Substitution
5. Initial Public Offerings (IPO's)

Comments on the Choice of the Substitution Variable

An important feature of the empirical analysis of letter volumes conducted by Diversified Specifics over the last 15 years is the increasing importance of substitution effects arising from emergent technologies.

These technologies are constantly evolving presenting challenges for the construction of time series methods to adequately reflect: 1) The advances inherent in these technologies; 2) How these advances impact upon the behavioural patterns of companies and individuals; and 3) the manner in which these changes translate into letter volume fluctuations.

In the case of Other (Ordinary) small letter volumes, Diversified Specifics cheque volumes has served as a reliable proxy variable for the effects of bill payments type substitution over a relatively long period of time. This is also true for the current empirical analysis of this segment. In respect to bill presentments and PreSort letter volumes in general, more recently, time series data on the growth of mobile and wireless broadband has become available. Various measurements and projections on these variables are available both domestically and internationally.

In all of these cases the electronic substitution variables require some element of construction as the data is often annual (or bi-annual) which necessitates interpolation methods to convert the data into a quarterly frequency. Splicing techniques are also utilised to combine several data sets to obtain a continuous time series that ultimately facilitates the estimation of the VECMs over the full range of the sample.

The initial broadband series employed by Diversified Specifics as a bill presentment substitution proxy in previous empirical analyses of letter volumes was based on fixed-line broadband data. Subsequently information on mobile broadband became available permitting a gradual melding with the original fixed-line broadband data to obtain an alternative substitution variable that reflected changes in technology as well as changes in substitutive trends.

For the PreSort small and large letter volume segments the constructed mobile/fixed-line broadband variable more adequately proxied changes in the technological and behavioural landscape associated with these two segments. The point estimates tended to be correctly signed and also statistically significant.

In the case of Other (Ordinary) large letter volumes, both of the aforementioned substitutive proxies as well as the hybrid combination of the two were considered. Of these the fixed-line broadband series represented a more statistically relevant fit for this letter segment with the point estimates being of the correct sign as well as statistically significant.

A comparison of these results for all letter segments suggest that the effects of electronic substitution on letter volumes varies across different letter segments, reflecting differences in behavioural attitudes towards PreSort and Other (Ordinary) letter volumes.

As another measure of substitution Diversified Specifics also tested the mobile wireless broadband series available from the Australian Bureau of Statistics (ABS). [48]

In the case of the PreSort small and large letter volume segments this series was unable to adequately capture the dynamic growth in neither broadband technologies nor the development of new types of technologies relating to the anticipated growth in digital mailboxes or equivalent portals.

Part of the reason for the failing of this series as a measurement proxy is its static nature and plateauing over recent years which is a reflection of subscription rates reaching a point of saturation. This is in contrast to the measurement objective of the variable which should be that of reflecting a changing behaviour on behalf of senders and recipients deciding between alternative communication channels.

In the case of the Other (Ordinary) large letter volume segment this alternative series lacked the required statistical associativity of the fixed-line broadband substitution variable adopted in the preferred empirical model.

Moreover given that the fixed-line broadband series employed in the empirical analysis within the current research undertaking was employed in previous studies, for commensurability this variable was taken as the best proxy of substitution for Other large letter volumes.

In summary, although difficulties of summarising a wide ranging number of individual and firm behaviours within a single electronic substitution measure exist, the statistical models, elasticities and forecasts undoubtedly benefit from augmenting the VECM analysis with some quantification of technological evolution.

The choices of electronic substitution variables utilised within this study whilst considered broad measures are applied with consistency and logical changes across a number of letter volume studies over a long period of time, facilitating comparisons across segments and over time.

Due to the impossibility of developing an all-encompassing measurement of electronic substitution targeted at each specific letter volume segment the estimation of the parameters associated with other downside such as real price effects should be treated with caution as

[48] Australian Bureau of Statistics Reference: 81530DO002_201012 and 81530do001_201406 Internet Activity, Australia, December 2010 and June 2014.

they might be compromised as a result of any inherent mis-specifications in the treatment of electronic substitution.

Comments on the Preliminary Tests of the VECMs

Determining the optimal lag structures for each of the letter segment specific Vector Autoregression's (VAR's) were based on a joint evaluation of the AIC, SC and HQ statistics.

Cointegration tests amongst the relevant variables were then conducted to determine the actual VECM specification (i.e. Model 3 with P-1 lags).

The choice of Model 3 for the VECM specification allows for intercepts in both the cointegrating equation (long-run relationships) and the error correction equations (short-run relationships).

At all times common sense testing on the parameters of the VECM necessitate that the long-run estimates must conform to recognised economic and intuitive sense.

This implies in the long-run component of the model all income effects should be positive whilst the parameters for price and substitution should be negative.

The results of the testing phase for the Optimal lag structures and for cointegration are summarised in Table A.1.

Detailed statistical output tables are contained within Appendix C.2 (Optimal VAR lag structure tests) and Appendix C.3 (Tests for cointegration).

Table A.1 Results of the Optimal VAR Lag Structure & Co-integration Tests by Letter Volume Segment

Letter Volume Segment	Optimal VAR Lag Structure	Co-integration Test Results
Other (Ordinary) Small	AIC: 4; SC: 1; HQ: 1	Model 3 with zero lags
PreSort Small	AIC: 2; SC: 2; HQ: 2	Model 3 with one lag
Other (Ordinary) Large	AIC: 4; SC: 1; HQ: 1	Model 3 with zero lags
PreSort Large	AIC: 3; SC: 1; HQ: 3	Model 3 with one lag

Dynamic OLS Modelling of PreSort Small Letter Volumes

Upon closer inspection of the estimated PreSort small letter volume VECM, a number of the parameter estimates are statistically insignificant.

In the case of letter volumes (first column of the estimated VECM in Table C.1.2 within Appendix C) the only parameter estimate that is statistically significant in the error-correction part of the VECM of this variable is its own lag. That is, the lag of the change in PreSort small letter volumes.

This result suggests that PreSort small letter volumes exhibits both weak and strong exogeneity.[49]

The real price equation (as given by the second column of the estimated VECM in Table C.1.2 within Appendix C) infers all associated parameter estimates are statistically insignificant leading to the conclusion that this variable is also weakly and strongly exogenous.

In contrast, in the case of the variable representing the health of advertising (third column of the estimated VECM in Table C.1.2 within Appendix C) is a function of the lags of the remaining variables within the system in addition to the error correction term.

Finally, the electronic substitution proxy variable (given by the fourth column of the estimated VECM in Table C.1.2 within Appendix C) suggests it may be represented simply as a function of its own lag as this variable is also weakly and strongly exogenous.

These combined results motivate the exploration of an alternative framework that economizes on lags in an attempt to uncover a more precise set of estimates relating to the cointegrating equation where issues surrounding degrees of freedom will not be as problematic.

The approach adopted is a single equation estimation framework due to the initial estimates of the PreSort small letter volume VECM which suggests the presence of a single error correction term.[50]

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[49] A weakly exogenous result suggests the variable is not a function of lags pertaining to the remaining variables within the system. Strongly exogeneity implies the variable is not a function of the lagged error correction term.

[50] A similar transition of the PreSort large letter volumes methodology from a VECM framework to a dynamic least squares equivalent proved problematic due to the nature of the detected lags on the IPO variable. This transition however is anticipated to continue during the course of subsequent letter volume demand updates in an attempt to economise on the lag structure in a similar manner to that applied to the PreSort small letter volume segment within this research undertaking.

Moreover, initial testing into the lag structure of the VAR combined with the point estimates of the parameters associated with the lagged variables suggest that the lag lengths used in a single equation approach should also be of a relatively low dimension.

There exists a range of single equation cointegrating methods and the approach adopted here is to use initially the dynamic least squares estimator of Saikkonen (1992) and Stock and Watson (1993).[51]

This estimator is an augmented dynamic least squares estimator where the cointegrating equation with all contained variables expressed in levels, is augmented with leads, contemporaneous and lags of changes in the drivers.

An intuitive discussion of the relationship between single and multiple cointegrating systems is given in Lim and Martin (1995).[52]

To validate the decision of pursuing an augmentation on the dynamic OLS estimator the results are also compared with the fully-modified estimator of Phillips and Hansen (1990), known to yield long-run parameter estimates that are relatively more robust to lag structure choices.[53]

As a basis of comparison the dynamic single equation estimates for the most general version of this estimator are derived (presented in Table C.4.1 within Appendix C).

Under these conditions the initial point estimate of the real PreSort small letter volume price elasticity is -0.86.

This estimate is very similar to the point estimate obtained from using the multivariate Johansen estimator where the point estimate is -0.82.

However as the single equation estimator is based on the inclusion of leads and lags of the changes in the variables the next iteration of results involves the dynamic least squares estimator augmentation to be restricted by including lags of the first differences of the drivers.

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[51] Saikkonen, P. (1992). "Estimation and Testing of Cointegrated Systems by an Autoregressive Approximation," *Econometric Theory*, 8, 1-27; and Stock, James H. and Mark Watson (1993). "A Simple Estimator Of Cointegrating Vectors In Higher Order Integrated Systems," *Econometrica*, 61, 783-820. For a recent review see: Martin, V.L., Hurn, S. and Harris, D. (2013), Econometric Modelling with Time Series: Specification, Estimation and Testing, Themes in Modern Econometrics, Cambridge University Press, New York.

[52] Lim G.C. & Martin V.L., 1995. "Regression-based cointegration estimators with applications," Journal of Economic Studies, Emerald Group Publishing, vol. 22(1), pages 3-22, January.

[53] Phillips, Peter C. B. and Hansen B.E. (1990). "Statistical Inference in Instrumental Variables Regression with I(1) Processes," Review of Economics Studies, 57, 99-125.

This result, as given in Table C.4.2 in Appendix C is a reduction in the real PreSort small letter volume price elasticity from -0.86 to -0.75.

However, the PreSort small letter volume VECM output provided within Table C.1.2 in Appendix C, stresses an empirical result that suggests many of the error correction equations only include own lags.

Consequently re-estimating the model via an exclusion of leads and lags of the first differences in the drivers might yield an even tighter inferential outcome, with augmentation solely emanating from the inclusion of contemporaneous changes in the drivers.

The results, provided in Table C.4.3 within Appendix C emphasise a further decrease in the real PreSort small letter volume price elasticity to -0.39.

As a point of comparison the fully modified estimator of Phillips and Hansen (1990) is presented in Table C.4.4 of Appendix C.

The resultant -0.32 estimate on the real PreSort small letter volume price elasticity is very similar to the restricted dynamic OLS result given immediately above.

An important advantage of the fully modified estimator is its robustness to the choice of lags when contrasted to other cointegrating estimators, especially the multivariate estimate based on the Johansen estimator which employs the PreSort small letter volume VECM specification.

The limiting case of the dynamic OLS framework is the Engle-Granger estimator which involves the application of OLS to the cointegrating equation in levels without any augmentation.[54]

The parameter estimates given in Table C.4.5 of Appendix C have the same consistency properties as the dynamic OLS and fully modified estimators in that they are all generate super-consistent parameter estimates.

From a statistical point of view the difference between the two estimators is that the standard errors of the Engle-Granger estimator do not yield tests statistics that are asymptotically normal as is the case for the dynamic OLS and fully modified estimators.

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[54] Engle, R. F. and Granger C. W. J. (1987), "Co-integration and Error Correction: Representation, Estimation, and Testing," Econometrica, 55, 251-276.

As a consequence it is appropriate to compare the point estimates but not the standard errors.

In doing so, the point estimate of the real PreSort small letter volume price elasticity has been marginally reduced further to -0.27 which is close to the restricted version of the dynamic OLS estimator results and the results from using the fully modified estimator.

As a further check on the sensitivity of the elasticity estimates an intermediate dynamic least squares regression is performed via the inclusion of an augmenting variable, the lag of the change in PreSort small letter volumes.

This choice is governed by the PreSort small letter volume VECM results as the parameter estimate of this variable registers as statistically significant.

Table C.4.6 of Appendix C reflects the results of estimating this dynamic regression where the real PreSort small letter volume price elasticity is -0.27.

As an estimate, this result is practically identical to the equivalent obtained under the aforementioned Engle-Granger system.

The point estimate of the associated price elasticity is -0.27 although statistically insignificant. The elasticity on the substitution variable is also negative however exhibiting a comparatively large level of statistical significance.

The health of the advertising industry (as proxied by the variable LNSP200C) under this framework losses it's statistical significance suggesting that movements are largely driven in the post global financial crisis era by substitutive effects and to a lesser extent real price changes.

This suggests the exclusion of the variable proxying the health of the Advertising industry from the model and a re-estimated cointegrating equation of the dynamic OLS estimator on the smaller tri-variate system.

For the case where augmentation is based on the contemporaneous changes in the drivers there is a slight increase in the real PreSort small letter volume price elasticity estimate from -0.39 to -0.40.

If applying the fully modified estimator the point estimate of the real price elasticity is practically identical at a value of -0.39.

Moreover, the price elasticity is statistically significant at the 10% level whilst the electronic substitution parameter estimate retains its negative association with PreSort small letter volumes at a statistically significant level.

To facilitate compatibility with the VECM framework the single equation PreSort small letter volume model is augmented to include the lagged change in own volumes despite that lag registering a statistically insignificant result.

This test phase resolved strong evidence to suggest the tri-variate model provided in Table C.4.7 of Appendix C generating a PreSort small letter volume price elasticity of -0.35 was the most appropriate for forecasting and explanatory purposes within this research undertaking.

Additional Comments on Long-run Model Specifications

The initial specifications of all four letter volume models include a real price variable for each segment.

For PreSort small, as well as Other (Ordinary) small and large letter volumes, the estimated price elasticity was of the intuitively correct sign in addition to being statistically significant at conventional levels.

In the case of the PreSort large letter volume model the estimated real price elasticity also embodied an intuitively correct sign, yet was highly statistically insignificant with t-statistic of 1.1632.

Moreover, the point estimate of this elasticity was -2.1985 which was relatively large in absolute value compared with the price elasticities estimated for the remaining segments which all emphasised an inelastic tendency.

This suggested the estimate of the real price elasticity for PreSort large letter volumes was both statistically and economically unreliable.

The imprecision of the estimated PreSort large letter volume real price elasticity was a combination of the relative degree of variation in the real price variable and the relative size of the VECM which can impact upon degrees of freedom.

To obtain a more reliable price elasticity estimate of PreSort large letter volumes the price variable was excluded from the VECM specification with the VECM re-estimated for a lower dimensional model.

A comparison of the point estimates with and without the real price variable suggested that this variable at best has a marginal impact upon PreSort large letter volumes as the estimated elasticities on the remaining drivers continued to be very robust to changes in this VECM specification.

Following on from the modelling strategy adopted for PreSort small letter volumes, a single equation dynamic modelling strategy was also adopted for PreSort large volumes to

determine whether greater precision in the parameter estimates could be attained even with the inclusion of the real price variable.

In all dynamic single equation specifications attempted evidence for the statistical insignificance of the real price variable continued to hold suggesting that this variable be excluded as a driver of PreSort large letter volumes within the final preferred econometric model.

As a result, the real price effects upon of PreSort large letter volumes were deemed to approach a point of perfect price inelasticity.

In regards to the Other (Ordinary) large letter volume model the results for the long-run illustrate Real GDP is weakly significant.

This variable has been constantly monitored by Diversified Specifics over a long period of time where it was initially found to be a statistically important driver however its role has diminished over time, essentially crowded out by the impacts of electronic substitution.

The decline in relative importance of Real GDP for this segment is emphasised by excluding this variable from the model. The result does not dramatically alter the long-run parameter estimates or the overall structure of the model.

For consistency with previously estimated models of this segmented undertaken as undertaken by Diversified Specifics this variable is retained for consistency while recognising that its role is continually diminishing as a driver of Other (Ordinary) large letter volumes.

Because of these reasons the continuing inclusion of this variable within the final forecasting models is under review for future letter volume demand updates.

Evolutionary Path of Seasonal Factors

Tables A.2 through A.5 illustrate the year on year progression of seasonal factors providing a quantitative summary of how the intra-year letter volume flows have altered for each of Australia Posts key letter segments since 1995/96.

Table A.2 Other (Ordinary) Small Letter Volumes

Quarterly Seasonal Factors by Year

	Q1	Q2	Q3	Q4
1995			99.6	114.0
1996	90.8	95.5	99.9	113.7
1997	91.1	95.1	100.2	113.6
1998	91.3	94.6	100.4	113.9
1999	91.2	94.0	100.7	114.4
2000	91.1	93.4	101.0	114.8
2001	90.9	93.0	101.2	115.3
2002	90.5	93.0	101.1	115.5
2003	90.3	93.2	101.0	115.3
2004	90.3	93.7	100.9	114.9
2005	90.4	94.2	100.6	114.5
2006	90.3	95.0	100.2	114.3
2007	90.2	95.6	100.1	114.0
2008	90.1	96.0	100.2	113.5
2009	90.2	96.1	100.3	113.1
2010	90.5	96.1	100.5	112.5
2011	91.0	96.1	100.5	112.1
2012	91.4	96.1	100.4	111.8
2013	91.6	96.3	100.3	111.7
2014	91.8	96.3	100.1	
AVGE	**90.8**	**94.9**	**100.5**	**113.8**

Table A.3 Other (Ordinary) Large Letter Volumes

Quarterly Seasonal Factors by Year

	Q1	Q2	Q3	Q4
1995			102.2	109.2
1996	90.0	98.4	102.6	109.1
1997	90.0	98.1	103.1	108.9
1998	89.9	97.8	103.7	108.6
1999	90.0	97.2	104.6	108.3
2000	90.1	96.3	105.5	108.0
2001	90.3	95.6	106.3	107.6
2002	90.5	95.4	106.7	107.3
2003	90.6	95.5	106.8	106.8
2004	90.9	95.8	106.7	106.0
2005	91.3	96.4	106.5	105.2
2006	91.7	97.2	105.9	104.8
2007	92.0	97.8	105.4	104.5
2008	92.3	98.1	105.0	104.5
2009	92.6	98.0	104.9	104.6
2010	92.7	98.0	104.6	104.7
2011	92.9	97.8	104.4	105.0
2012	93.0	97.6	104.2	105.2
2013	93.2	97.4	104.2	105.3
2014	93.2	97.4	104.1	
AVGE	**91.4**	**97.1**	**104.9**	**106.5**

Table A.4 PreSort Small Letter Volumes

Quarterly Seasonal Factors by Year

	Q1	Q2	Q3	Q4
1995			105.3	103.1
1996	95.6	96.1	105.2	102.9
1997	95.6	96.6	104.9	102.6
1998	95.7	97.4	104.2	102.3
1999	95.8	98.4	103.4	102.0
2000	96.0	99.3	102.5	101.9
2001	96.2	99.8	102.1	101.8
2002	96.3	99.9	101.9	101.9
2003	96.2	99.8	102.2	101.8
2004	96.2	99.5	102.6	101.8
2005	96.1	99.3	102.9	101.8
2006	95.9	99.2	103.0	101.9
2007	95.8	99.1	103.3	102.0
2008	95.8	98.8	103.6	101.8
2009	95.8	98.5	104.2	101.5
2010	95.9	98.2	104.8	100.9
2011	96.2	97.8	105.5	100.2
2012	96.6	97.5	106.0	99.7
2013	96.8	97.3	106.2	99.5
2014	97.0	97.3	106.2	
AVGE	**96.1**	**98.4**	**104.0**	**101.7**

Table A.5 PreSort Large Letter Volumes

Quarterly Seasonal Factors by Year

	Q1	Q2	Q3	Q4
1995			99.4	121.6
1996	83.4	95.7	98.8	122.8
1997	82.6	95.6	98.5	123.7
1998	81.9	95.7	98.6	124.1
1999	81.4	96.3	98.5	123.5
2000	82.2	95.4	99.0	122.9
2001	83.3	94.3	100.0	121.5
2002	85.1	92.7	100.9	120.9
2003	85.9	92.2	100.8	121.5
2004	85.8	91.3	100.9	122.8
2005	84.9	90.9	102.1	122.5
2006	84.3	90.3	104.4	120.7
2007	84.5	89.4	107.2	118.4
2008	84.8	88.6	109.9	116.1
2009	85.6	87.6	112.5	113.5
2010	86.5	87.0	114.0	111.8
2011	87.5	86.6	114.6	110.9
2012	88.0	86.6	114.2	111.0
2013	88.2	86.6	114.1	111.0
2014	88.3	86.6	114.1	
AVGE	**85.0**	**91.0**	**105.1**	**119.0**

APPENDIX B

DATA & DATA DESCRIPTIONS

Internal Australia Post Data

Australia Post supplied the following data to Diversified Specifics:

- Small & large letter revenue based volumes;
- PreSort small letter charge account volumes by industry;
- Small & large letter delivery service performance.

Externally Sourced Data

To facilitate association testing and the development of econometric models, Diversified Specifics obtained variables from various external sources. Each variable that was sourced and assessed is outlined in Table A.1. Variables obtained were used to test developed hypothesis in an unbiased and structured manner.

Externally sourced variables outlined below that were not included in the final econometric models, were not found to be statistically significant in relation to segment-specific volumes.

Table A.1 Externally Sourced Data Descriptions

Volume Predictor	Variable	Series Timeframe Utilised (Data Frequency)	Data Source
Australian Non-farm GDP	Australian Non-farm GDP	September 1995 to September 2014 – Quarterly series	Gross Domestic Product minus Agriculture, Forestry and Fishing (A), Cat. No. 5206.0 Table 6 Gross Value Added by Industry, Australia, Chain volume measures, Australian Bureau of Statistics
Advertising Industry Health Measure	S&P/ASX 200 Consumer Discretionary Index	September 1995 to September 2014 – Quarterly series	S&P/ASX 200 Consumer Discretionary Index, Yahoo Finance
Credit Card Volumes	Credit Card Volumes	July 1995 to September 2014 – Monthly series	Number of Accounts, Credit and Charge Card Statistics - C1, Reserve Bank of Australia
Cheque Volumes	Cheque Volumes	January 2002 to September 2014 – Monthly series	Total Number of Cheques, Cheques and Direct Entry Payments - C6, Reserve Bank of Australia

Volume Predictor	Variable	Series Timeframe Utilised (Data Frequency)	Data Source
Real Price of Other (Ordinary) Small Letters	Real Price of Other (Ordinary) Small Letters	September 1995 to September 2014 – Quarterly series	Nominal price of Other (Ordinary) Small Letters: Australia Post; CPI: ABS Cat. No. 6401.0 TABLES 1 and 2. All Groups, Index Numbers and Percentage Changes , Consumer Price Index, Australian Bureau of Statistics
Real Price of Other (Ordinary) Large Letters	Real Price of Other (Ordinary) Large Letters	September 1995 to September 2014 – Quarterly series	Nominal price of Other (Ordinary) Large Letters: Australia Post; CPI: ABS Cat. No. 6401.0 TABLES 1 and 2. All Groups, Index Numbers and Percentage Changes , Consumer Price Index, Australian Bureau of Statistics
Real Price of PreSort Small Letters	Real Price of PreSort Small Letters	September 1995 to September 2014 – Quarterly series	Nominal price of PreSort Small Letters: Australia Post; CPI: ABS Cat. No. 6401.0 TABLES 1 and 2. All Groups, Index Numbers and Percentage Changes , Consumer Price Index, Australian Bureau of Statistics
Real Price of PreSort Large Letters	Real Price of PreSort Large Letters	September 1995 to September 2014 – Quarterly series	Average Revenue Factors: Letters Group, Australia Post; CPI: ABS Cat. No. 6401.0 TABLES 1 and 2. All Groups, Index Numbers and Percentage Changes , Consumer Price Index, Australia Bureau of Statistics
Domestic Broadband Index	Domestic Broadband Index	March 2002 to September 2014 – Quarterly series	Created by Diversified Specifics. Original Data from (1): 81530DO002_201012 Internet Activity, Australia, Dec 2010, Australian Bureau of Statistics (2): Snapshot of Broadband Deployment, Australian Competition and Consumer Commission
Information Media and Telecommunications Industry	Information Media and Telecommunications Industry	September 1995 to September 2014 – Quarterly series	Information media and telecommunications (J), Cat. No. 5206.0 Table 6 Gross Value Added by Industry, Australia, Chain volume measures, Australian Bureau of Statistics
Finance and Insurance Services Industry	Finance and Insurance Services Industry	September 1995 to September 2014 – Quarterly series	Financial and insurance services (K), Cat. No. 5206.0 Table 6 Gross Value Added by Industry, Australia, Chain volume measures, Australian Bureau of Statistics
Public Administration and Safety Industry	Public Administration and Safety Industry	September 1995 to September 2014 – Quarterly series	Public administration and safety (O), Cat. No. 5206.0 Table 6 Gross Value Added by Industry, Australia, Chain volume measures, Australian Bureau of Statistics

Volume Predictor	Variable	Series Timeframe Utilised (Data Frequency)	Data Source
Rental, Hiring & Real Estate Services Industry	Rental, Hiring & Real Estate Services Industry	September 1995 to September 2014 – Quarterly series	Rental, hiring and real estate services (L), Cat. No. 5206.0 Table 6 Gross Value Added by Industry, Australia, Chain volume measures, Australian Bureau of Statistics
Retail Trade Industry	Retail Trade Industry	September 1995 to September 2014 – Quarterly series	Retail trade (G), Cat. No. 5206.0 Table 6 Gross Value Added by Industry, Australia, Chain volume measures, Australian Bureau of Statistics
Wholesale Trade Industry	Wholesale Trade Industry	September 1995 to September 2014 – Quarterly series	Wholesale trade (F), Cat. No. 5206.0 Table 6 Gross Value Added by Industry, Australia, Chain volume measures, Australian Bureau of Statistics
Health Care and Social Assistance Industry	Health Care and Social Assistance Industry	September 1995 to September 2014 – Quarterly series	Health care and social assistance (Q), Cat. No. 5206.0 Table 6 Gross Value Added by Industry, Australia, Chain volume measures, Australian Bureau of Statistics
Education & Training Industry	Education & Training Industry	September 1995 to September 2014 – Quarterly series	Education and training (P), Cat. No. 5206.0 Table 6 Gross Value Added by Industry, Australia, Chain volume measures, Australian Bureau of Statistics
Manufacturing Industry	Manufacturing Industry	September 1995 to September 2014 – Quarterly series	Manufacturing (C), Cat. No. 5206.0 Table 6 Gross Value Added by Industry, Australia, Chain volume measures, Australian Bureau of Statistics
Australian Population	Estimated Australian Population	September 1995 to September 2014 – Quarterly series	ABS Cat. No. 3101.0 Table 1. Population Change, Summary - Australia ('000)
Paper as an Input Cost	Paper as an Input Cost	July 1995 to September 2014 – Monthly series	15 Pulp, paper and converted paper product manufacturing, ABS Producer Price Index Table 10 and 11 Cat Number 642702
Paper as an Input Cost for Direct Mail	Paper as an Input Cost for Direct Mail	July 1995 to September 2014 – Monthly series	1523 Paper stationery manufacturing, ABS Producer Price Index Table 10 and 11 Cat Number 642704
Business Confidence	NAB Business Confidence Index	September 1995 to September 2014 – Quarterly series	Net balance (NSA)+100, NAB business confidence index, Reserve Bank of Australia
Consumer Sentiment Index	Consumer Sentiment Index	July 1995 to September 2014 – Monthly series	Indicators of Spending and Confidence, Westpac-Melbourne Institute consumer sentiment index, Reserve Bank of Australia
Barcoding Introduction	Introduction of Barcoding Technology	Dichotomous Variable	Internally constructed variable – Diversified Specifics

Volume Predictor	Variable	Series Timeframe Utilised (Data Frequency)	Data Source
Closure of the Unbarcoded PreSort Service	Unbarcoded PreSort Service and Go Mail Discontinuation	Dichotomous Variable	Internally constructed variable – Diversified Specifics
The Economic Downturn	Economic Downturn	Dichotomous Variable	Internally constructed variable – Diversified Specifics
Mobile Wireless Broadband Connections	Mobile Wireless Broadband Connections	June 2009 to June 2014 – Biannual series	Australian Bureau of Statistics (2014), ABS Cat No. 81530do001_201406 Internet Activity, Internet subscribers by type of access connection, for ISP's with more than 1,000 subscribers, Mobile Wireless, Australia.
Initial Public Offerings	Market Capitalisation associated with Large Initial Public Offerings	September 2007 to September 2014 – Quarterly series	Internally constructed variable – Diversified Specifics using data from the Australian Stock Exchange ASX Top 300 companies and the Australian Financial Review Online

APPENDIX C

KEY STATISTICAL OUTPUTS

C.1 Vector Error Correction Models

Table C.1.1. Other (Ordinary) Small Letter Volumes Vector Error Correction Model

Vector Error Correction Estimates
Date: 03/15/15 Time: 10:25
Sample (adjusted): 2002Q2 2014Q3
Included observations: 50 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LNSADJOT(-1)	1.000000
LNSADJCH(-1)	-0.514932
	(0.01248)
	[-41.2588]
LNREALPR(-1)	0.410286
	(0.12665)
	[3.23962]
C	0.296314

Error Correction:	D(LNSADJOT)	D(LNSADJCH)	D(LNREALPR)
CointEq1	-0.643762	-0.138250	-0.039293
	(0.09653)	(0.08549)	(0.13519)
	[-6.66888]	[-1.61721]	[-0.29064]
C	-0.012051	-0.026961	0.002134
	(0.00311)	(0.00276)	(0.00436)
	[-3.87109]	[-9.77979]	[0.48936]
R-squared	0.480935	0.051671	0.001757
Adj. R-squared	0.470121	0.031914	-0.019040
Sum sq. resids	0.023258	0.018240	0.045618
S.E. equation	0.022012	0.019494	0.030828
F-statistic	44.47399	2.615363	0.084473
Log likelihood	120.8810	126.9567	104.0397
Akaike AIC	-4.755239	-4.998266	-4.081590
Schwarz SC	-4.678758	-4.921785	-4.005109
Mean dependent	-0.012051	-0.026961	0.002134
S.D. dependent	0.030240	0.019812	0.030539

Determinant resid covariance (dof adj.)	1.67E-10
Determinant resid covariance	1.48E-10
Log likelihood	353.0500
Akaike information criterion	-13.76200
Schwarz criterion	-13.41783

Table C.1.2. PreSort Small Letter Volumes Vector Error Correction Model

Vector Error Correction Estimates
Date: 02/14/15 Time: 09:13
Sample: 2008Q1 2014Q3
Included observations: 27
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LNSADJPR(-1)	1.000000
LNREALPR(-1)	0.820813
	(0.35402)
	[2.31855]
LNSP200C(-1)	-0.361389
	(0.03125)
	[-11.5639]
LNMOBILE(-1)	0.083684
	(0.02013)
	[4.15668]
C	-5.583159

Error Correction:	D(LNSADJPR)	D(LNREALPR)	D(LNSP200C)	D(LNMOBILE)
CointEq1	-0.065437	0.024818	0.785870	0.194357
	(0.07185)	(0.08501)	(0.09282)	(0.13824)
	[-0.91077]	[0.29193]	[8.46622]	[1.40593]
D(LNSADJPR(-1))	-0.419984	-0.039851	0.382067	0.079804
	(0.17822)	(0.21088)	(0.23025)	(0.34291)
	[-2.35654]	[-0.18898]	[1.65935]	[0.23273]
D(LNREALPR(-1))	-0.008545	-0.192508	-0.679438	0.045118
	(0.21810)	(0.25806)	(0.28178)	(0.41964)
	[-0.03918]	[-0.74597]	[-2.41127]	[0.10751]
D(LNSP200C(-1))	-0.028637	-0.030464	0.204512	-0.024444
	(0.06521)	(0.07715)	(0.08424)	(0.12546)
	[-0.43918]	[-0.39486]	[2.42768]	[-0.19484]
D(LNMOBILE(-1))	0.031258	-0.000544	0.888128	0.486310
	(0.11158)	(0.13203)	(0.14416)	(0.21470)
	[0.28013]	[-0.00412]	[6.16068]	[2.26512]
C	-0.016459	0.009665	-0.103757	0.059137
	(0.01404)	(0.01661)	(0.01814)	(0.02702)
	[-1.17224]	[0.58176]	[-5.71985]	[2.18903]
R-squared	0.257298	0.033564	0.908542	0.340962
Adj. R-squared	0.080464	-0.196540	0.886767	0.184049
Sum sq. resids	0.016384	0.022938	0.027347	0.060654
S.E. equation	0.027932	0.033050	0.036086	0.053743
F-statistic	1.455024	0.145866	41.72281	2.172928
Log likelihood	61.68710	57.14455	54.77111	44.01725
Akaike AIC	-4.124971	-3.788485	-3.612675	-2.816092
Schwarz SC	-3.837007	-3.500521	-3.324711	-2.528129
Mean dependent	-0.009413	0.008735	-0.015164	0.114361
S.D. dependent	0.029128	0.030214	0.107240	0.059496

Determinant resid covariance (dof adj.)	1.64E-12
Determinant resid covariance	6.01E-13
Log likelihood	226.6526
Akaike information criterion	-14.71501
Schwarz criterion	-13.37118

Table C.1.3. Other (Ordinary) Large Letter Volumes Vector Error Correction Model

Vector Error Correction Estimates
Date: 01/09/15 Time: 14:39
Sample: 2008Q1 2014Q3
Included observations: 27
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LNSADJOT(-1)	1.000000
LNSADJNO(-1)	-0.352036
	(0.25630)
	[-1.37351]
LNREALPR(-1)	0.784811
	(0.12988)
	[6.04237]
LNDOMEBR(-1)	0.190828
	(0.04768)
	[4.00210]
C	-5.976144

Error Correction:	D(LNSADJOT)	D(LNSADJNO)	D(LNREALPR)	D(LNDOMEBR)
CointEq1	-0.246823	-0.002549	0.020408	0.189974
	(0.08382)	(0.01125)	(0.07432)	(0.02565)
	[-2.94479]	[-0.22648]	[0.27460]	[7.40518]
C	-0.005884	0.005757	0.001213	0.032618
	(0.00790)	(0.00106)	(0.00701)	(0.00242)
	[-0.74466]	[5.42596]	[0.17317]	[13.4876]
DUM_2014Q2	-0.140024	0.004367	0.073236	-0.004059
	(0.03107)	(0.00417)	(0.02755)	(0.00951)
	[-4.50650]	[1.04669]	[2.65823]	[-0.42677]
R-squared	0.480462	0.060028	0.241712	0.734742
Adj. R-squared	0.437167	-0.018303	0.178521	0.712637
Sum sq. resids	0.037023	0.000667	0.029108	0.003468
S.E. equation	0.039276	0.005274	0.034826	0.012021
F-statistic	11.09744	0.766332	3.825124	33.23896
Log likelihood	50.68135	104.8943	53.92867	82.64737
Akaike AIC	-3.531952	-7.547725	-3.772494	-5.899805
Schwarz SC	-3.387970	-7.403743	-3.628512	-5.755824
Mean dependent	-0.016256	0.006080	0.006638	0.032318
S.D. dependent	0.052353	0.005226	0.038424	0.022426

Determinant resid covariance (dof adj.)	1.08E-15
Determinant resid covariance	6.73E-16
Log likelihood	318.3659
Akaike information criterion	-22.39748
Schwarz criterion	-21.62957

Table C.1.4. PreSort Large Letter Volumes Vector Error Correction Model

Vector Error Correction Estimates
Date: 03/30/15 Time: 19:29
Sample (adjusted): 2008Q1 2014Q3
Included observations: 27 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1	Cointegrating Eq:	CointEq1
LNSADJPR(-1)	1.000000	LNSP200C(-1)	-1.150115
LNMOBILE(-1)	0.153886		(0.19906)
	(0.04049)		[-5.77775]
	[3.80025]		
IPO(-1)	-0.010273	C	11.16310
	(0.00653)		
	[-1.57441]		

Error Correction:	D(LNSADJPR)	D(LNMOBILE)	D(IPO)	D(LNSP200C)
CointEq1	-0.040413	0.010349	13.41252	0.178290
	(0.03908)	(0.03722)	(8.57952)	(0.03571)
	[-1.03422]	[0.27806]	[1.56332]	[4.99263]
D(LNSADJPR(-1))	-0.436926	-0.513024	27.15127	-0.408532
	(0.20563)	(0.19586)	(45.1496)	(0.18793)
	[-2.12477]	[-2.61938]	[0.60136]	[-2.17389]
D(LNMOBILE(-1))	-0.013065	0.430465	66.08516	0.929557
	(0.21288)	(0.20276)	(46.7410)	(0.19455)
	[-0.06137]	[2.12302]	[1.41386]	[4.77798]
D(IPO(-1))	-0.000156	0.000355	-0.738589	0.002004
	(0.00077)	(0.00073)	(0.16900)	(0.00070)
	[-0.20222]	[0.48417]	[-4.37025]	[2.84890]
D(LNSP200C(-1))	0.097403	0.073693	-5.976325	0.359788
	(0.12502)	(0.11908)	(27.4503)	(0.11426)
	[0.77908]	[0.61886]	[-0.21771]	[3.14894]
C	-0.016089	0.060104	-7.147924	-0.122004
	(0.02695)	(0.02567)	(5.91776)	(0.02463)
	[-0.59695]	[2.34131]	[-1.20788]	[-4.95314]
R-squared	0.195533	0.453184	0.633256	0.844305
Adj. R-squared	0.003993	0.322990	0.545936	0.807234
Sum sq. resids	0.055475	0.050325	2674.337	0.046332
S.E. equation	0.051397	0.048954	11.28492	0.046971
F-statistic	1.020847	3.480830	7.252124	22.77575
Log likelihood	45.22199	46.53727	-100.3522	47.65329
Akaike AIC	-2.905332	-3.002761	7.877941	-3.085429
Schwarz SC	-2.617369	-2.714797	8.165905	-2.797465
Mean dependent	-0.014325	0.114361	-1.324074	-0.014112
S.D. dependent	0.051500	0.059496	16.74711	0.106984

Determinant resid covariance (dof adj.)	6.78E-07
Determinant resid covariance	2.48E-07
Log likelihood	52.07995
Akaike information criterion	-1.783700
Schwarz criterion	-0.439869

C.2 Optimal Lag Structure Tests

Table C.2.1 Other (Ordinary) Small Letter Volumes VAR Lag Order Selection Criteria

VAR Lag Order Selection Criteria
Endogenous variables: LNSADJOT LNSADJCH LNREALPR
Exogenous variables:
Date: 03/15/15 Time: 10:22
Sample: 2002Q1 2014Q3
Included observations: 47

Lag	LogL	LR	FPE	AIC	SC	HQ
1	336.9794	NA	1.74e-10*	-13.95657	-13.60229*	-13.82325*
2	343.8260	11.94512	1.92e-10	-13.86494	-13.15637	-13.59830
3	347.8018	6.429072	2.40e-10	-13.65114	-12.58829	-13.25118
4	364.7262	25.20647*	1.75e-10	-13.98835*	-12.57121	-13.45507

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table C.2.2 PreSort Small Letter Volumes VAR Lag Order Selection Criteria

VAR Lag Order Selection Criteria
Endogenous variables: LNSADJPR LNREALPR LNSP200C LNMOBILE
Exogenous variables:
Date: 02/18/15 Time: 08:29
Sample: 2008Q1 2014Q3
Included observations: 27

Lag	LogL	LR	FPE	AIC	SC	HQ
1	198.2031	NA	1.63e-11	-13.49653	-12.72862	-13.26819
2	232.5303	48.31226*	4.48e-12*	-14.85409*	-13.31829*	-14.39742*
3	248.4810	17.72304	5.45e-12	-14.85044	-12.54673	-14.16543
4	256.5887	6.606324	1.53e-11	-14.26583	-11.19422	-13.35248

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table C.2.3 Other (Ordinary) Large Letter Volumes VAR Lag Order Selection Criteria

VAR Lag Order Selection Criteria
Endogenous variables: LNSADJOT LNSADJNO LNREALPR LNDOMEBR
Exogenous variables: DUM_2014Q2
Date: 01/09/15 Time: 14:46
Sample: 2008Q1 2014Q3
Included observations: 27

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-9.697144	NA	3.24e-05	1.014603	1.206579	1.071688
1	326.3307	547.6010	1.67e-15	-22.69116	-21.73129*	-22.40574
2	346.3039	26.63094*	1.36e-15	-22.98548	-21.25769	-22.47172
3	367.8167	22.30952	1.15e-15	-23.39383	-20.89814	-22.65173
4	392.7787	18.49041	1.02e-15*	-24.05768*	-20.79409	-23.08725*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table C.2.4 PreSort Large Letter Volumes VAR Lag Order Selection Criteria

VAR Lag Order Selection Criteria
Endogenous variables: LNSADJPR LNREALPR LNSP200C LNMOBILE IPO
Exogenous variables:
Date: 02/14/15 Time: 10:38
Sample: 2008Q1 2014Q3
Included observations: 26

Lag	LogL	LR	FPE	AIC	SC	HQ
1	108.0521	NA	1.18e-09	-6.388623	-5.178915*	-6.040271
2	144.8039	45.23294*	5.77e-10	-7.292605	-4.873189	-6.595901
3	182.5374	31.92840	3.95e-10*	-8.272110*	-4.642985	-7.227053*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

C.3 Tests for Cointegration

Table C.3.1 Other (Ordinary) Small Letter Volumes Unrestricted Cointegration Rank Test

Date: 03/15/15 Time: 10:23
Sample (adjusted): 2002Q2 2014Q3
Included observations: 50 after adjustments
Trend assumption: Linear deterministic trend
Series: LNSADJOT LNSADJCH LNREALPR
Lags interval (in first differences): No lags
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.492086	45.46605	29.79707	0.0004
At most 1	0.161860	11.59390	15.49471	0.1775
At most 2	0.053806	2.765362	3.841466	0.0963

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level

Table C.3.2 PreSort Small Letter Volumes Unrestricted Cointegration Rank Test

Date: 02/14/15 Time: 09:11
Sample: 2008Q1 2014Q3
Included observations: 27
Trend assumption: Linear deterministic trend
Series: LNSADJPR LNREALPR LNSP200C LNMOBILE
Lags interval (in first differences): 1 to 1
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.873695	80.25318	47.85613	0.0000
At most 1	0.413086	24.38868	29.79707	0.1845
At most 2	0.280895	10.00101	15.49471	0.2807
At most 3	0.039844	1.097816	3.841466	0.2947

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table C.3.3 Other (Ordinary) Small Letter Volumes Unrestricted Cointegration Rank Test

Date: 01/09/15 Time: 14:43
Sample: 2008Q1 2014Q3
Included observations: 27
Trend assumption: Linear deterministic trend
Series: LNSADJOT LNSADJNO LNREALPR LNDOMEBR
Exogenous series: DUM_2014Q2
Warning: Critical values assume no exogenous series
Lags interval (in first differences): No lags
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.952715	109.0933	47.85613	0.0000
At most 1	0.422523	26.70137	29.79707	0.1091
At most 2	0.281993	11.87605	15.49471	0.1630
At most 3	0.102891	2.931601	3.841466	0.0869

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table C.3.4 PreSort Large Letter Volumes Unrestricted Cointegration Rank Test

Date: 02/14/15 Time: 10:44
Sample: 2008Q1 2014Q3
Included observations: 27
Trend assumption: Linear deterministic trend
Series: LNSADJPR LNREALPR LNSP200C LNMOBILE IPO
Lags interval (in first differences): 1 to 1
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.815764	89.63732	69.81889	0.0006
At most 1	0.536227	43.96586	47.85613	0.1107
At most 2	0.379410	23.22012	29.79707	0.2354
At most 3	0.299367	10.33884	15.49471	0.2556
At most 4	0.026783	0.733011	3.841466	0.3919

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

C.4 Auxiliary PreSort Small Letter Volume Models and Testing

Table C.4.1 PreSort Small Letter Volumes initial DOLS general estimate based upon VECM Specification

Dependent Variable: LNSADJPR
Method: Dynamic Least Squares (DOLS)
Date: 03/14/15 Time: 07:43
Sample (adjusted): 2007Q3 2014Q3
Included observations: 29 after adjustments
Cointegrating equation deterministics: C
Fixed leads and lags specification (lead=1, lag=1)
Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth =4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNREALPR	-0.860712	0.270194	-3.185531	0.0057
LNMOBILE	-0.038936	0.018071	-2.154559	0.0468
LNSP200C	0.050384	0.036503	1.380266	0.1865
C	9.671910	0.816846	11.84055	0.0000

R-squared	0.934732	Mean dependent var	6.183059
Adjusted R-squared	0.885780	S.D. dependent var	0.079810
S.E. of regression	0.026973	Sum squared resid	0.011641
Long-run variance	0.000464		

Table C.4.2 PreSort Small Letter Volumes DOLS estimate with Lags of the 1st Differences of the Drivers

Dependent Variable: LNSADJPR
Method: Dynamic Least Squares (DOLS)
Date: 03/14/15 Time: 07:52
Sample (adjusted): 2007Q3 2014Q3
Included observations: 29 after adjustments
Cointegrating equation deterministics: C
Fixed leads and lags specification (lead=0, lag=1)
Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth =4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNREALPR	-0.751518	0.244715	-3.070993	0.0063
LNMOBILE	-0.047603	0.014008	-3.398246	0.0030
LNSP200C	0.039459	0.027439	1.438083	0.1667
C	9.468733	0.781435	12.11711	0.0000

R-squared	0.931304	Mean dependent var	6.183059
Adjusted R-squared	0.898764	S.D. dependent var	0.079810
S.E. of regression	0.025394	Sum squared resid	0.012252
Long-run variance	0.000459		

Table C.4.3 PreSort Small Letter Volumes DOLS estimate without Lags of the 1st Differences of the Drivers

Dependent Variable: LNSADJPR
Method: Dynamic Least Squares (DOLS)
Date: 03/14/15 Time: 07:58
Sample (adjusted): 2007Q2 2014Q3
Included observations: 30 after adjustments
Cointegrating equation deterministics: C
Fixed leads and lags specification (lead=0, lag=0)
Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth =4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNREALPR	-0.389842	0.233034	-1.672900	0.1079
LNMOBILE	-0.056826	0.015556	-3.653094	0.0013
LNSP200C	-0.004995	0.027536	-0.181385	0.8577
C	8.652553	0.788243	10.97701	0.0000

R-squared	0.891440	Mean dependent var	6.184583
Adjusted R-squared	0.863120	S.D. dependent var	0.078865
S.E. of regression	0.029178	Sum squared resid	0.019581
Long-run variance	0.001050		

Table C.4.4 Fully Modified PreSort Small Letter Volumes DOLS estimate using the Phillips and Hansen (1990) method

Dependent Variable: LNSADJPR
Method: Fully Modified Least Squares (FMOLS)
Date: 03/14/15 Time: 08:01
Sample (adjusted): 2007Q2 2014Q3
Included observations: 30 after adjustments
Cointegrating equation deterministics: C
Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth= 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNREALPR	-0.322555	0.206329	-1.563302	0.1301
LNMOBILE	-0.056681	0.014802	-3.829338	0.0007
LNSP200C	-0.014770	0.028136	-0.524939	0.6041
C	8.504829	0.737084	11.53848	0.0000

R-squared	0.875055	Mean dependent var	6.184583
Adjusted R-squared	0.860639	S.D. dependent var	0.078865
S.E. of regression	0.029441	Sum squared resid	0.022537
Long-run variance	0.001226		

Table C.4.5 Fully Modified PreSort Small Letter Volumes DOLS estimate using the Engle-Granger method

Dependent Variable: LNSADJPR
Method: Least Squares
Date: 03/14/15 Time: 08:10
Sample (adjusted): 2007Q1 2014Q3
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8.458692	0.589256	14.35486	0.0000
LNREALPR	-0.274792	0.169580	-1.620431	0.1168
LNMOBILE	-0.058956	0.011964	-4.927665	0.0000
LNSP200C	-0.023922	0.023563	-1.015258	0.3190

R-squared	0.868248	Mean dependent var	6.186072
Adjusted R-squared	0.853609	S.D. dependent var	0.077982
S.E. of regression	0.029837	Akaike info criterion	-4.066242
Sum squared resid	0.024036	Schwarz criterion	-3.881211
Log likelihood	67.02674	Hannan-Quinn criter.	-4.005926
F-statistic	59.31008	Durbin-Watson stat	1.213740
Prob(F-statistic)	0.000000		

Table C.4.6 Intermediate DOLS regression Inclusive of the lag of the change in PreSort small letter volumes

Dependent Variable: LNSADJPR
Method: Least Squares
Date: 03/11/15 Time: 12:58
Sample (adjusted): 2007Q1 2014Q3
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8.475512	0.600120	14.12303	0.0000
LNREALPR	-0.274748	0.172281	-1.594764	0.1229
LNMOBILE	-0.058591	0.012189	-4.806899	0.0001
LNSP200C	-0.025373	0.024211	-1.047971	0.3043
D(LNSADJPR(-1))	0.075136	0.187912	0.399844	0.6925

R-squared	0.869053	Mean dependent var	6.186072
Adjusted R-squared	0.848907	S.D. dependent var	0.077982
S.E. of regression	0.030312	Akaike info criterion	-4.007856
Sum squared resid	0.023889	Schwarz criterion	-3.776567
Log likelihood	67.12176	Hannan-Quinn criter.	-3.932461
F-statistic	43.13842	Durbin-Watson stat	1.308788
Prob(F-statistic)	0.000000		

Table C.4.7 Final Dynamic Ordinary Least Squares PreSort small letter volumes model

Dependent Variable: LNSADJPR
Method: Least Squares
Date: 03/14/15 Time: 10:00
Sample (adjusted): 2007Q1 2014Q3
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8.341554	0.587414	14.20047	0.0000
LNREALPR	-0.346093	0.158547	-2.182903	0.0379
LNMOBILE	-0.052302	0.010629	-4.920903	0.0000
D(LNSADJPR(-1))	0.045626	0.186128	0.245134	0.8082

R-squared	0.863522	Mean dependent var	6.186072
Adjusted R-squared	0.848358	S.D. dependent var	0.077982
S.E. of regression	0.030367	Akaike info criterion	-4.030999
Sum squared resid	0.024898	Schwarz criterion	-3.845969
Log likelihood	66.48049	Hannan-Quinn criter.	-3.970684
F-statistic	56.94461	Durbin-Watson stat	1.283797
Prob(F-statistic)	0.000000		

APPENDIX D

CAVEATS ON ECONOMETRIC FORECASTS

The interpretation of the forecasts relating to segmented letter volumes via empirical modelling techniques must be conducted with all due caution. The ex-ante forecasts generated in this research undertaking are econometric in nature and they therefore depend heavily upon:

- Accurately forecasting future growth rates for each of the exogenous drivers;
- An assumption that prior statistical associations detected by the modelling continues to hold over the forecast period (which may not always be the case);
- An assumption of comprehensiveness governing the statistically significant segmented letter volume drivers. That is, there are other variables logically associated with each segment however significant variation over the sampled timeframe may not have been evident. As a consequence these drivers tend to be excluded from the econometric models; &
- The global and national economy remaining similar to that of the sampled timeframe.

The methodology employed acknowledges these limitations and the impossibility of embedding all possible contingencies within the ex-ante forecast estimates. It is therefore recommended that any interpretation of the forecast results generated by these models be augmented by further internal and market intelligence. That is, the generation of baseline ex-ante forecasts provided in this document should necessarily represent an initial step in the forecasting process at Australia Post.

Ultimately the baseline must be augmented via further market intelligence on the emerging trends that are not directly measurable within an econometric framework.

The nature of developing econometric models based on historical data also suggests a need for on-going refinements and research to ensure an adequate currency of both the statistical associations and forecasts produced via the econometric models.

In developing the econometric forecasts an ideal scenario would involve a longer timeframe, an increased number of observations and greater degrees of freedom.

These considerations were evaluated against the desire to estimate a set of parameters that more accurately reflect the status quo rather than examining a lengthier timeframe where the current forces of substitution, pricing and economic growth do not apply. In this regard a series of structural break tests have largely dictated the commencement dates for statistical evaluation and the results of these tests are summarised in Appendix A of this report.