Cloud Storage Pricing: A Comparison of Current Practices

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ABSTRACT

Cloud storage is fast securing its role as a major repository for both consumers and business customers. Many companies now offer storage solutions, sometimes for free for limited volumes. The most apparent means of competition is pricing, though the complexity of pricing plans may make a comparison difficult. We have surveyed the pricing plans of a selection of major cloud providers and compared them using the unit price as the means of comparison. We find that all the providers, excepting Amazon, adopt a bundling pricing scheme; Amazon follows instead a block-declining pricing policy. Our comparison of pricing plans is conducted through a double approach: a pointwise comparison for each value of storage volume, and an overall comparison using a two-part tariff approximation and a Pareto-dominance criterion. Under both approaches, most providers appear to offer pricing plans that are more expensive and can be excluded from a procurement selection in favour of a limited number of dominant providers.

Categories and Subject Descriptors

H.3 [**Information Systems**]: Information Storage and Retrieval; K.6 [**Computing Milieux**]: Management of computing and information systems

Keywords

Economics; Cloud storage; Pricing

1. INTRODUCTION

Cloud storage is a fast growing service, whereby an individual or a company stores its data on a storage facility owned and managed by a third party (the cloud provider). The actual storage facility may be positioned at a single location or scattered around the globe, but the cloud user does not need to know. Cloud users can eliminate their own storage infrastructure, relying on the cloud only. The migration from an owned infrastructure to a leased one has the immediate benefit of avoiding capital investments in favour of a more flexible expense management based on operational expenses only [11]. The decision to migrate has however to weigh the risk components associated to both solutions. Capital investments are one-off in nature but they may lead to savings in the long run [13]. In addition, switching to the cloud may expose the cloud user to the lock-in phenomenon and price rises (though the decision to continue buying disks is exposed to disk price rises as well) [12]. But a cloud user can also keep its own infrastructure and use the cloud for backup purposes only.

In either case, the cloud storage market is forecast to expand, and the need to evaluate the different offers grows as well. Though a service can be thoroughly described just by the complete set of its features, the most relevant point of differentiation seems to be the price. The risk of commoditization of cloud computing (of which cloud storage may be an ancillary function) has been pointed out by Durkee [5], as has been the case with the web hosting industry. In fact, at present cloud providers are pushing price as the most attractive leverage to get users choose their platform.

Though the complexity of a service proposition cannot be captured by price only, and other issues should be considered, such as storage workload, bandwidth, availability, and latency [2], [4] [16] [15], in this early analysis we focus on price in the context of cloud storage only. A comparison of the technical merits of commercial cloud platforms has been reported in [9], but no economic analysis has been accomplished so far. However, a comparison of pricing plans for cloud storage is needed to decide whether to migrate or not. In every analysis conducted so far about the opportunity to migrate, one or more pricing plans have been adopted to draw conclusions about that opportunity: in [20] and [11], just Amazon's prices have been employed, while in [1] those prices has been used along with four other providers (Rackspace, GoGrid, Nirvanix, and EMC Atmos). In addition, analysing the pricing plans proposed by cloud providers helps understand the price structure of the industry and its economies of scale.

In this paper, we conduct a survey of pricing plans proposed by major cloud providers. All prices have been gathered on the web and are correct at the time of writing, though they may vary in the future.

For each pricing plan, we compute the unit price to uncover the strength of economies of scale. In addition, we fit the pricing data to a basic semi-variable price model, which includes just two parameters: the fixed fee and the variable

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Company	Website
Dropbox	www.dropbox.com
SugarSync	www.sugarsync.com
IDrive	www.idrivesync.com
Google Drive	drive.google.com
Carbonite	www.carbonite.com
Symform	www.symform.com
Mozy	mozy.ie
Amazon	aws.amazon.com/s3/

Table 1: Cloud storage providers

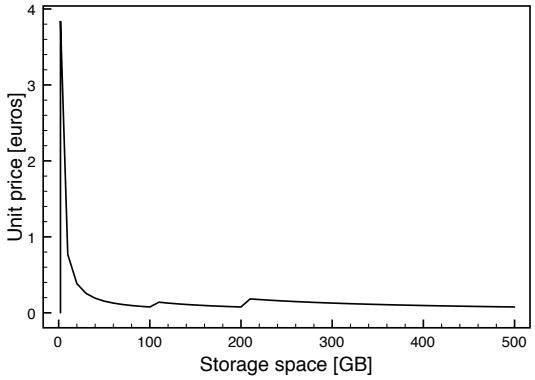

Figure 1: Unit prices of Dropbox for consumers

price per unit. We perform a Pareto-dominance analysis and find that some pricing plans are dominated by others and could be removed from the shortlist of providers to consider.

The paper is structured as follows. In Section 2, we provide some indications about the current market size and composition. For the major providers we provide all the pricing data in Section 3. The pricing plans are then classified and compared in Section 4. We finally introduce the two-part tariff approximation and use it to perform a Pareto-dominance analysis in Section 5.

2. THE MARKET OF CLOUD STORAGE

The cloud storage market is rapidly increasing. A number of providers offer solutions both for consumers and companies, with the list increasing each day (Google is the latest addition with its Google Drive service). In this section, we provide some figures for the market size and list the major cloud providers we are going to examine in this paper.

Official figures for the size of the cloud storage market are not available. Some estimates have been distributed, typically by consulting firms. IDC estimates that the total spending on storage systems, software, and professional services by public cloud providers will increase to $10.9 billion in 2015 [19]. An alternative estimate by the Taneja Group gives a figure of $4B for the market today, with a growth to almost $10B by 2014 [3], giving a compound annual growth rate of over 35%. According to a recent study released by Gartner, the percentage of consumer content stored in the cloud will grow from a slight 7% in 2011 to 36% in 2016 [18].

We have collected data from major cloud providers. We base our analysis on publicly advertised prices and don't consider those companies that do not provide a public price list or provide storage just as a part of an inclusive service. In the following, we analyze the providers of Table 1.

3. SURVEY OF ADVERTISED PRICES

For our survey we have considered a wide range of cloud providers, as detailed in Section 2. We have collected pricing information on their websites and obtained the unit prices. In this section, we provide the details of the price survey for each provider. All prices are correct at the time of writing, though they may vary in the future. Though prices may be originally given in $, we have converted all the money amounts in euros through a fixed conversion rate (1 € = 1.3 $). In order to get a level comparison, all prices are referred to a month of usage.

Many providers address separately consumers and companies, by providing specific pricing plans. Different prices for the two categories come along with differentiated service features, among which the most relevant seems to be the number of computers that can be backed up on the cloud platform. Typically, consumer pricing plans allow for just one computer, while business pricing plans all cater for more users. We stick to the consumer vs business classification.

Whenever a provider offers several pricing packages that address the same category, in the following we consider the cheapest one for the amount of memory required.

3.1 Dropbox

Dropbox offers a popular storage service for both consumers and companies. A free basic service is available for consumers, with a storage volume up to 2 GB. In the paid packages, the maximum capacity envisaged is 500 GB for consumers, while no limit is advertised for business customers.

For consumers, just two paid packages are offered (*Pro100*, *Pro200*, and *Pro500*), which charge respectively 9.99 $/month, 19.99 $/month, and 49.99 $/month. The resulting monthly unit prices are shown in Figure 1. If we neglect the portion of the curve corresponding to the free package, the price curve is piecewise hyperbolic, with three local minima, corresponding respectively to the passage from *Pro100* to *Pro200*, from *Pro200* to *Pro500*, and to the full exploitation of the *Pro500* package. By joining the local minima, we obtain a baseline providing the unit prices of full capacity exploitation for each pricing package. In this case, the two local minima give roughly the same unit price of 0.077 €/month.

A pricing formula based on the number of customers is instead implied for business customers. In the business package (named *Teams*), the number of users is employed as the price driver, rather than the amount of memory. However, a relation is provided between the number of users and the maximum amount of available memory. The basic offer considers 5 users, to which 1 TB is associated, and then adds 200 GB for each additional user. The basic package is priced at 795 $ per year, and each additional chunk of 200 GB comes at 125$ per year. On the basis of Dropbox pricing information, we can derive the following formula relating the monthly price P (in $) to the number k of customers

$$P = \frac{170 + 125k}{12} \qquad k \geq 5. \tag{1}$$

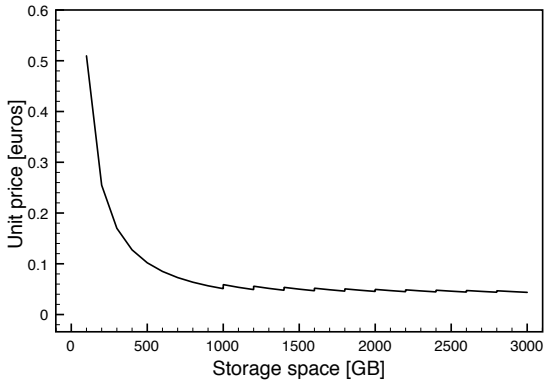

Figure 2: Unit prices of Dropbox for companies

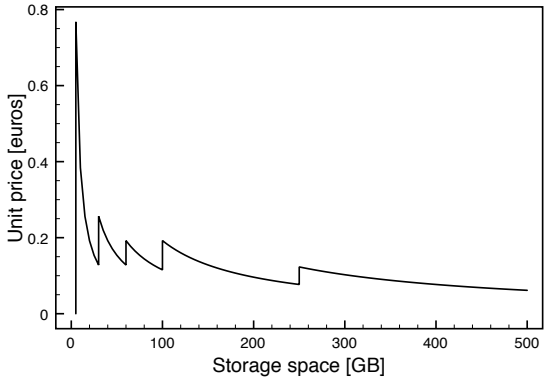

Figure 3: Unit prices of SugarSync (consumers)

The local minima of the monthly unit price, obtained when each volume chunk is fully exploited, are given by

$$p_k = \frac{170 + 125k}{2400k} \qquad k \geq 5, \tag{2}$$

which is a decreasing function of k (made of hyperbolic sections), starting at 0.06625 \$ (0.051 €) and tending to the limit value 0.052 \$, roughly equivalent to 0.04 euros, just 52% of the minimum price available to consumers. The monthly unit price for business customers is shown in Figure 2. Again, we observe the same sawtooth-like trend and the overall economy of scale.

3.2 SugarSync

SugarSync proposes several plans directed to consumers, starting with a free plan with a maximum capacity of 5 GB. The paid plans consider increasing capacity brackets, up to the maximum capacity of 500 GB. The resulting unit prices are shown in Figure 3, where we can observe the usual sawtooth-like curve. Here the imaginary baseline is slightly downward, from 0.128 € at the first breakpoint at 30 GB down to 0.061 € at the maximum capacity.

For companies SugarSync advertises a single plan (others can be provided on demand, but details are not publicly available), whereby an initial capacity of 1 TB is offered at a fixed fee of 55 \$/month (though an unlimited capacity is advertised). The resulting unit price is a hyperbola with a minimum corresponding to the full exploitation of the allocated capacity (i.e., 1 TB), which is 0.023€/GB per month.

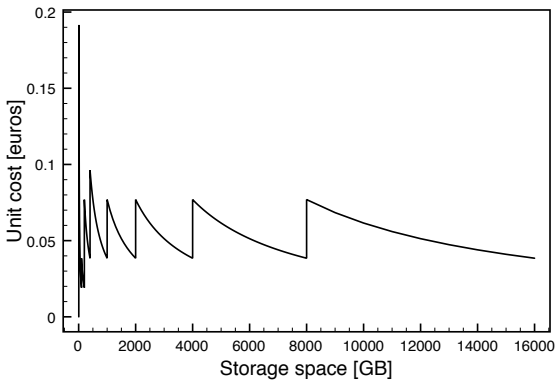

Figure 4: Unit prices of Google Drive

3.3 IDrive

IDRive offers online storage services both for consumers and business customers. In addition to the free package (*IDriveSync Basic*) including 10 GB of space, they offer the *IDriveSync Pro* package at 4.95\$/month with 150 GB and the *IDriveSync Pro 500GB* package at 14.95\$/month with 500 GB.

The resulting unit price is a hyperbola, with a minimum corresponding to the full exploitation of the allowed storage space, which is 0.025€/GB per month for the Pro package and 0.023 €/GB per month for the Pro500 package.

3.4 Google Drive

Google's cloud storage service *Google Drive* includes a free plan, which allows users to upload up to 5 GB. The free plan is associated to other Google services, which actually increase the amount of info that can be stored on Google's servers.

There appears to be a single set of pricing plans, which are not explicitly directed to either business customers or consumers. However, the absence of particular features in the service advertisement leads to classify that set under the consumer label. The offer is proposed in the usual form of a set of fixed fees, each associated to a maximum capacity. The resulting unit price is shown in Figure 4. We find the usual sawtooth-like curve, with a remarkable baseline at 0.05 \$ (roughly equivalent to 0.038 €).

3.5 Carbonite

Carbonite offers pricing plans for both customer categories. There are three pricing plans for consumers, which all boast an unlimited online backup for a fixed fee. The fee is different for the three pricing plans (named *Home*, *HomePlus*, and *HomePremier*), reflecting different features (see Table 2). The Home plan does not include External hard drive backup and Mirror Image backup. The HomePremier plan includes also the Courier Recovery service. As to business customers, Carbonite offers instead two pricing plans, which are differentiated by storage capacity: the *Business* plan accepts up to 250 GB; the *BusinessPremier* accepts up to 500 GB. By considering the two plans as a single offer subdivided into two capacity brackets, we obtain the unit

Pricing plan	Yearly fee [$]
Home	59
HomePlus	99
HomePremier	149

Table 2: Pricing plans of Carbonite for consumers

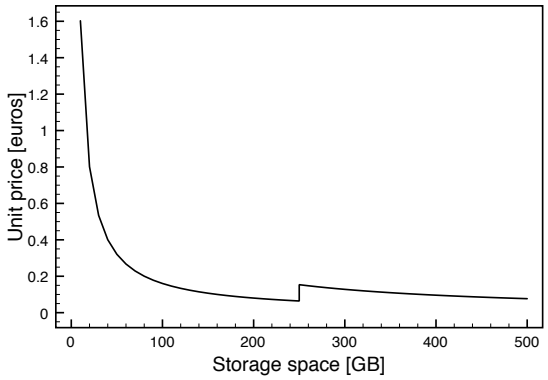

Figure 5: Unit prices of Carbonite for companies

price shown in Figure 5, with the usual step in the passage from a bracket to the next.

3.6 Symform

The solution offered by Symform is different from what most cloud providers propose. Symform describes itself as a network, where each member of the network contributes excess local storage in exchange for affordable cloud storage, a formula they advertise as *Pay with bytes* vs *Pay with bucks*. Their pricing scheme is made of two components, respectively associated to cloud space and support plans. This peer-to-peer network builds therefore a mutual backup system. Aside from security and privacy considerations, the peculiarity of Symform's solution makes it noncomparable with the pricing plans we have analysed so far. However, in the *Pay with bucks* case customers get 10 GB of free space and pay 0.15$/GB per month for every additional 2GB chunk. Support plans start 14.99$ per month for a storage space up to 300GB, but rise up to 199.99$ per month when the maximum storage space is 4TB. In the following, we consider the *Pay with bucks* option for the comparison, whose resulting unit price is shown in Figure 6.

3.7 Mozy

Mozy has pricing plans for both customer categories, plus an offer directed at enterprises (with prices available on-demand, which we have then neglected in our survey). The offer for consumers is divided into two brackets, with the second one allowing for three computers rather than just one. The limit capacity is 125 GB for consumers and 1 TB for business customers. The resulting unit price is shown in Figure 7 and Figure 8 respectively. In the business case we can locate a baseline at 0.3 €.

3.8 Amazon

Amazon proposes a storage service named *Simple Storage Service* (often identified as Amazon S3). Their offer

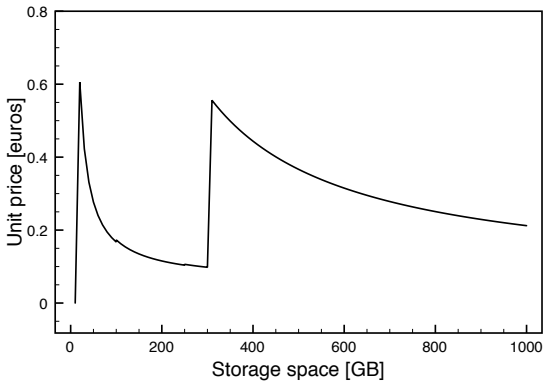

Figure 6: Unit prices of Symform

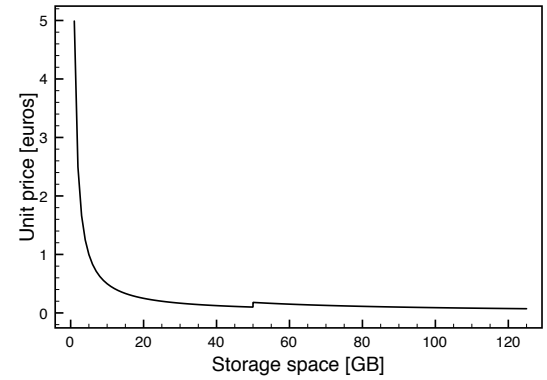

Figure 7: Unit prices of Mozy for consumers

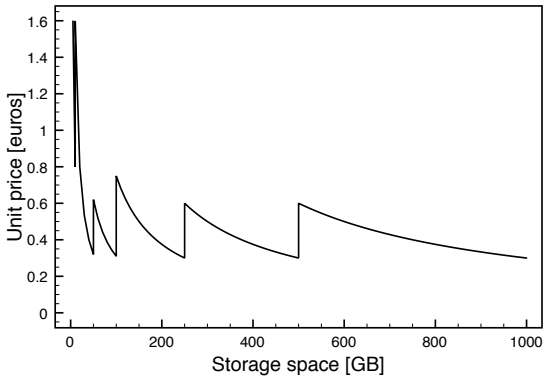

Figure 8: Unit prices of Mozy for companies

Maximum amount of data [TB]	Price per month per GB[$] Standard	Reduced Redundancy
1	0.095	0.076
50	0.080	0.064
500	0.070	0.056
1000	0.065	0.052
5000	0.060	0.048
10000	0.055	0.037

Table 3: Price list of Amazon

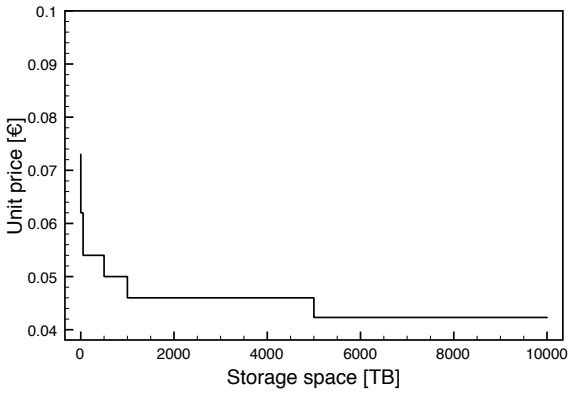

Figure 9: Unit price of Amazon S3

includes three versions: Standard Storage, Reduced Redundancy Storage, and Glacier Storage. The second one trades reduced reliability for a discounted price, while the third one is optimized for data that is infrequently accessed and for which retrieval times of several hours are suitable (we neglect it in the following).

The price list for Standard and Reduced Redundancy Storage is shown in Table 3. It is to be noted that Amazon provides unit prices, while all the other providers release lump prices valid up to a specified amount of data. The discount obtained by reducing reliability is 20% for all capacity ranges, excepting the last one where it is 33%. In addition, we notice that the range of data volumes supported by the service is very wide, with a maximum capacity of 5 million GB. However, we must also consider that Amazon also charges for all operations on the data (downloading, uploading, and changes), so that the overall cost can be much higher than that due to storage alone.

In the following, we consider just the standard version. The resulting unit price curve (a stairwise one) is shown in Figure 9. We observe a significant volume discount.

4. PRICING PLANS COMPARISON

In Section 3, we have reported the pricing plans of a wide selection of cloud providers. In this section, we proceed to categorize those plans and compare them, searching for the cheapest ones.

We start by observing that most pricing plans allow for some free space (see Table 4). Typical values are either 5 or 10 GB, which, though a very small fraction of the typical storage space on one's own laptop computer (of the order of one or few percentage points), could be enough for storing data that a customer wants to share temporarily.

Provider	Free storage space [GB]
Dropbox	2
SugarSync	5
Symform	10
IDrive	10
Google Drive	5

Table 4: Amount of free space

Aside from the free storage offered for limited quantities, all the pricing plans currently adopted by cloud providers allow for price discrimination by quantity, introducing some form of volume discount. However, they are not all equal and fall into two categories: declining block rate charge and bundling.

The first pricing model is also named taper and is a particular type of the general block rate pricing, where the range of consumption is subdivided into subranges, and the unit price is held constant over each subrange. More formally, in a block rate tariff the overall price charged to the customer for a volume of consumption x is

$$p = \begin{cases} v_1 x & \text{if } 0 < x \leq q_1 \\ v_1 q_1 + v_2(x - q_1) & \text{if } q_1 < x \leq q_2 \\ \cdots & \\ \sum_{i=1}^{m-1} v_i q_i + v_m(x - q_{m-1}) & \text{if } q_{m-1} < x \leq q_m \end{cases} \quad (3)$$

where the v_i's are the sequence of marginal prices, and the q_i's bracket the subranges over which the marginal price is held constant. In Equation (3), we assume that the cloud provider does not provide more than q_m units of storage ($m \geq 2$). In turn, block rate pricing can be seen as a special form of multi-part tariff, where the fixed fee has been set equal to zero.

The overall charge is then a piecewise linear function of the amount of storage capacity (see Figure 10). Diminishing prices at the margin stimulate consumption, which in turn permits the construction of large scale capacity.

Block rate pricing has been studied by a number of authors. A consistent theory for block tariffs has been developed in [7].

Of all the cloud providers examined, just Amazon follows a declining block rate pricing model.

All the other providers adopt instead a bundling pricing model (which in the literature is also called *quantity discount*). According to the definition given by Shy [17], a seller practices bundling if the firm sells packages containing at least two units of the same product or service, where the price of a package containing several units of the same good is lower than the sum of the prices if the goods were purchased separately. In our case, all the providers opt for multiple bundling, where more than one package is offered for sale, and at least one package contains at least two units.

By using multiple packages, the cloud provider can address the different demand functions of its customers and extract as much profit as possible from each of them. By selecting the right quantities to be included in the bundles, the seller can design a preference revealing mechanism and

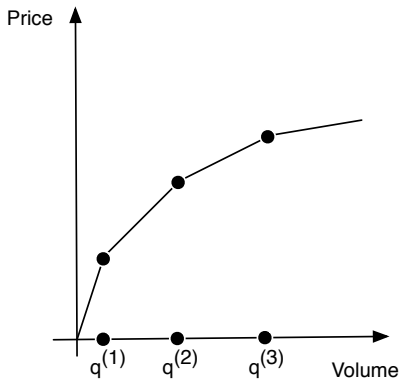

Figure 10: Price-volume relationship in block rate pricing

segment the market among the consumer types. In [17] an example is shown with two consumer types and two packages.

Given the dichotomy in the pricing models adopted by cloud providers (though the two groups are extremely unbalanced), it is natural to ask which is better. Kolay and Shaffer have derived the conditions under which bundling is better than block rates for the seller [10]. For the case of two consumer types that differ in their quantity demanded of a product of fixed quality, they have shown that profits for the seller are higher with bundling than with two-part tariffs as long as standard single-crossing conditions apply and as long as it is optimal to serve all consumers (so that there is no consumer with zero demand). The single-crossing condition requires that the demand curve of a high-demand consumer is weakly above the demand curve of a low-demand consumer. Of course, the direction of comparison reverses if we adopt the viewpoint of the customer rather than the cloud provider.

Though the cloud providers, with the exception of Amazon, all adopt the bundling pricing model, the differences among them lie in the price they charge. If we stick to price as the dominant criterion of choice (the general assumption here is that the quality is equal for all providers), the prospective customer has to compare all the proposed pricing plans and pick up the cheapest. Since, the unit price varies widely with the amount of storage leased, in the following we perform a pointwise comparison, by identifying the cheapest cloud provider for each capacity bracket. We underline that the comparison is conducted by taking into account just prices, without reference to the additional features that the pricing plan may incorporate. Of course, any price analysis is contingent on current pricing plans and is subject to revision when those plans change. In cloud storage, both Amazon and Google slashed their prices in November 2012.

We report the results in Table 5 for the companies adopting a bundling pricing plan (i.e., all except Amazon). As to consumers, the field is largely dominated by Google Drive (for smaller capacity values) and IDrive (for moderate to large capacity values). In the 100-150 GB range the unit price of both providers are practically identical, differing for less than 1%. If we included Amazon, the best would be Amazon itself, but just for volumes up to 25GB, and neglecting its transaction costs, which would bring further down its convenience. For business customers, the dominant players for small to moderate capacity values (roughly up to 500 GB) is IDrive. For larger capacity values Dropbox takes definitely the lead, since the other companies do not provide public pricing plans for very large volumes. As to Amazon, even neglecting transaction costs, its price for sheer storage is higher than Dropbox.

Volume bracket [GB]	Most convenient provider
Consumers	
10-100	Google Drive
100-150	Google Drive and IDrive
150-200	Google Drive
200-500	IDrive
Business	
10-500	IDrive
500-1000	SugarSync
1000-10000	Dropbox

Table 5: Comparison of unit prices

5. PARETO DOMINANCE

In Section 4, we have classified the pricing plans and compared them on a pointwise basis. Though all but one belong to the class of bundling packages, the pricing plans differ from one another for the choice of prices and bundles, which makes a pointwise comparison the only possibility. However, such a comparison does not tell us anything about the structural properties of the pricing plan. We recognize that bundling is a form of nonlinear pricing, where the unit price changes with quantity to reflect the presence of fixed costs and the variation of marginal costs. For the purpose of comparing the structure of pricing plans, we can consider the simplest form of nonlinear pricing: a two-part tariff. In this section, we develop a two-part tariff approximation for all the pricing plans considered and use that approximation to classify them.

In the two-part tariff scheme, the customer pays an initial fixed fee f for the first unit (often justified as a subscription, access, or installation charge), plus a smaller constant price for each unit [21]. The overall price charged to the customer is

$$p = f + v \cdot x, \tag{4}$$

where v is the marginal price, and x is the volume of consumption, i.e., the amount of storage volume. The resulting amount charged to the consumer is a linear function of the storage volume. For large volumes the fixed fee is gradually absorbed and its impact is less relevant, highlighting the economy of scale embedded in the service process. The unit price is

$$p^{(1)} = \frac{f}{x} + v, \tag{5}$$

which has the shape of a hyperbola and asymptotically tends to the marginal price v.

In order to obtain a two-part approximation for the bundling pricing plans shown in Section 3, we must estimate the val-

Pricing plan	$\hat{f}$	$\hat{v}$
Consumers		
Google Drive	0.899	0.0511
IDrive	3.42	0.0217
Dropbox	7.488	0.0681
SugarSync	3.231	0.089
Mozy	4.91	0.033
Amazon	4.008	0.0521
Symform	2.19	0.265
Business		
Dropbox	47.449	0.0193
IDrive	6.3	0.077
SugarSync	42.308	0
Carbonite	15.23	0.038
Mozy	6.60	0.401
Amazon	4.008	0.0521

Table 6: Parameters of two-part approximation model

ues of the two parameters f and v. For that purpose, we adopt a least-square approach.

If we sample the unit price curves, we obtain a set of $(x, p^{(1)})$ points for each pricing plan. The distance between the actual pricing plan and the two-part model is

$$Q = \sum_i \left(\frac{f}{x_i} + v - p_i^{(1)} \right)^2. \tag{6}$$

We obtain the best estimates for the two parameters f and v through minimizing Q, i.e., zeroing the two derivatives $\partial Q/\partial f$ and $\partial Q/\partial v$. This is tantamount to solving the system of two linear equations

$$\begin{aligned} \sum_i \frac{1}{x_i} \left(\frac{f}{x_i} + v - p_i^{(1)} \right) = 0, \\ \sum_i \left(\frac{f}{x_i} + v - p_i^{(1)} \right) = 0. \end{aligned} \tag{7}$$

For a set of n points the resulting estimates are

$$\begin{aligned} \hat{f} &= \frac{n \sum_i p_i^{(1)}/x_i - \sum_i p_i^{(1)} \sum_i 1/x_i}{n \sum_i 1/x_i^2 - \left(\sum_i 1/x_i \right)^2}, \\ \hat{v} &= \frac{\sum_i p_i^{(1)} - \hat{f} \sum_i 1/x_i}{n}. \end{aligned} \tag{8}$$

The resulting values for the parameters are shown in Table 6.

We can now exploit the parameters of the two-part tariff approximations to compare the structure of the pricing plans. We first plot the couple of parameter values obtained for each cloud provider in Figure 11 and Figure 12 for consumers and business customers respectively. A price structure is to be considered attractive if both the fixed fee and the variable price per unit are low. On the scatterplots just introduced, the best pricing plans are those represented by points in the bottom left corner (low fixed fee f and low marginal price v); the worst ones are instead those located in the top right corner. Large differences appear between the pricing plans. In the case of consumers, the smallest and largest fees are offered respectively by Google Drive and

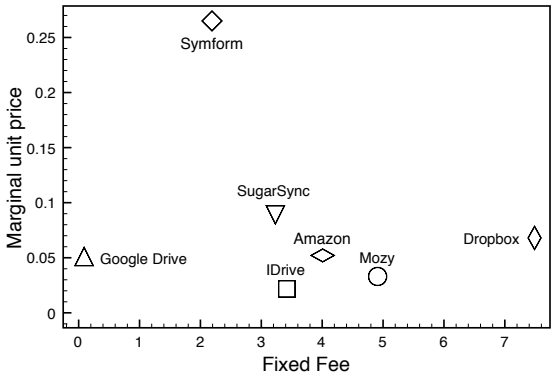

Figure 11: Two-part tariff parameters for consumers

Dropbox, while IDrive and Symform offer respectively the smallest and largest marginal price. In the case of business customers, SugarSync exhibits a zero marginal price, but Amazon offers the smallest fixed fee.

We can perform an overall comparison among the several pricing plans by using the concept of *Pareto dominance*. The concept of Pareto dominance is of extreme importance in multi-objective optimization. Given a set of objectives, a solution is said to Pareto dominate another if the first is not inferior to the second in all objectives, and, additionally, there is at least one objective where it is better (see chapter 6 of [6]). Pareto dominance has been applied extensively in the context of service tariffing (see, e.g., the works [14] and [8]). Here we take the customer's viewpoint and consider as its objective the minimization of the price whatever the quantity of storage volume that is leased. In the comparison between two two-part tariff schemes, this objective is reached iff both parameters in Equation (4) are lower in one of the two scheme instances. We therefore say that a pricing plan dominates another if both its f and its v are lower. In order to identify the most attractive pricing plan, we can therefore eliminate the dominated ones.

If we look at the consumer pricing plans shown in Figure 11, we see that there is not a single dominant plan, but Symform, SugarSync, and Dropbox are dominated by Google Drive and can therefore be removed from the competition. Mozy and Amazon (as well as Dropbox) are instead dominated by IDrive. In the end, the best two pricing plans are those offered by Google Drive and IDrive, neither of which dominates the other. In the case of business pricing plans, IDrive and Mozy are dominated by Amazon. Dropbox is dominated by SugarSync, and Carbonite is not dominated by either Amazon or SugarSync. We end up with three best competitors: Amazon, Carbonite, and SugarSync. But we must consider that Amazon and Dropbox are the only ones offering very large volumes, and Dropbox's very low marginal price in the end beats Amazon.

6. CONCLUSIONS

We have surveyed the cloud storage packages offered by major providers and put them on a level ground by computing the unit price for each of them over the whole range of volume values. With the notable exception of Amazon (which adopts a block-declining pricing scheme), all providers adopt a bundling policy. We have compared the pricing

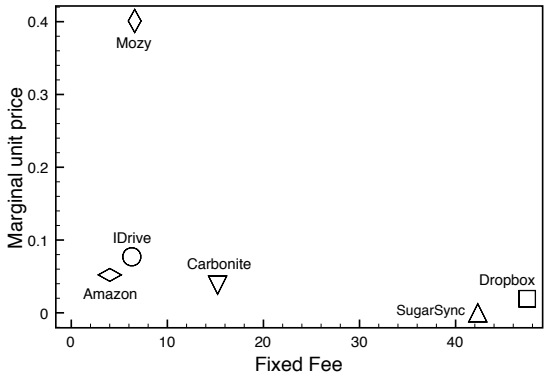

Figure 12: Two-part tariff parameters for companies

plans both on a pointwise basis and on the overall (through a two-part tariff approximation, which uncovers the fixed fee and the marginal price of each pricing plan). Through the first analysis, we determine the cheapest pricing plan for each volume range. Through the two-part tariff approximation, we apply a Pareto dominance analysis to identify dominated pricing plans, which can be removed from the shortlist of providers from which to choose. In both analyses, a limited number of providers are to be considered as prospective providers on the basis of price only.

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